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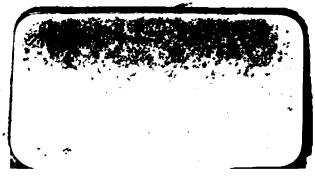

"O wisdom, truly perfect! thus to call,
From a few causes, such a scheme of things,
Effects so various, beautiful, and great."

Thomson.

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The number of separate bones in the human frame is about 248. Eight separate bones in the skull, form a vault or cell, in which the brain is inclosed. —HARTLEY'S *Principles of the Sciences.*

"I challenge any man (says Dr. Paley) to produce, in the joints and pivots of the most complicated or the most flexible machine that was ever contrived, a construction more artificial, or more evidently artificial than that which is seen in the vertebræ of the *human neck.* Two things were to be done: the head was to have the power of bending forward and backward, as in the act of nodding, stooping, looking upward or downward, and, at the same time, of turning itself round upon the body to a certain extent, the quadrant we will say, or rather, perhaps, a hundred and twenty degrees of a circle. For these two purposes two distinct contrivances are employed; first, the head rests immediately upon the uppermost of the vertebræ, and is united to it by a *hinge*-joint; upon which joint the head plays freely forward and backward, as far either way as is necessary, or as the ligaments allow, which was the first thing required: secondly, to make the head capable of this, a further mechanism is introduced; not between the head and the uppermost bone of the neck, where the hinge is, but between that bone and the bone next underneath it. It is a mechanism resembling a *tenon and mortise.* This second, or uppermost bone but one, has what anatomists call a process, viz., a projection, somewhat similar, in size and shape, to a tooth; which tooth entering a corresponding hole or socket in the bone above it, forms a pivot or axle, upon which that upper bone, together with the head which it supports, turns freely in a circle; and as far in the circle as the attached muscles permit the head to turn. Thus are both motions perfect, without interfering with each other. When we nod the head, we use the hinge-joint, which lies between the head and the first bone of the neck.

When we turn the head round, we use the tenon and mortise, which runs between the first bone of the neck and the second. We see the same contrivance and the same principle employed in the frame or mounting of a telescope. It is occasionally requisite that the object end of the instrument be moved up and down, as well as horizontally or equatorially. For the vertical motion, there is a hinge, upon which the telescope plays; for the horizontal or equatorial motion, an axis upon which the telescope and the hinge turn round together. And this is exactly the mechanism which is applied to the motion of the head."

The circulation of the blood from the head into the arteries is thus described by the same elegant writer:

"The next thing to be considered is the engine which works this machinery, viz., the *heart*. For our purpose it is unnecessary to ascertain the principle upon which the heart acts. Whether it be irritation excited by the contact of the blood, by the influx of the nervous fluid, or whatever else be the cause of its motion, it is something which is capable of producing, in a living muscular fibre, reciprocal contraction and relaxation. This is the power we have to work with; and the inquiry is, how this power is applied in the instance before us. There is provided, in the central part of the body, a hollow muscle, invested with spiral fibres, running in both directions, the layers intersecting one another; in some animals, however, appearing to be semicircular rather than spiral. By the contraction of these fibres, the sides of the muscular cavities are necessarily squeezed together, so as to force out from them any fluid which they may at that time contain; by the relaxation of the same fibres, the cavities are in their turn dilated, and, of course prepared to admit every fluid which may be poured into them, Into these cavities are inserted the great trunks, both of the arteries which carry out the blood, and

of the veins which bring it back. This is a general account of the apparatus; and the simplest idea of its action is, that by each contraction, a portion of the blood is forced by a syringe into the arteries; and, at each dilation, an equal portion is received from the veins. This produces, at each pulse, a motion and change in the mass of blood, to the amount of what the cavity contains, which in a full-grown human heart is about an ounce, or two table spoonsfull. How quickly these changes succeed one another, and by this succession how sufficient they are to support a stream or circulation throughout the system, may be understood from the following computation.—Each ventricle will, at least, contain one ounce of blood. The heart contracts four thousand times in one hour: from which it follows that there pass through the heart, every hour, four thousand ounces, or three hundred and fifty pounds of blood. Now the whole mass of blood is said to be about twenty-five pounds; so that a quantity of blood, equal to the whole mass of blood, passes through the heart fourteen times in one hour, which is about once every four minutes. Consider what an affair this is, when we come to very large animals. The aörta of a whale is larger in the bore than the main-pipe of the water-works at London Bridge; and the water roaring in its passage through that pipe is inferior in impetus and velocity, to the blood gushing from the whale's heart. Hear Dr. Hunter's account of the dissection of a whale: "The aörta measured a foot diameter: ten or fifteen gallons of blood are thrown out of the heart at a stroke, with an immense velocity, through a tube of a foot diameter.' The whole idea fills the mind with wonder."—PALEY's *Theology*.

REMARKABLE MEN.

MAGLIABECHI.

ANTONIO MAGLIABECHI was born at Florence, October 29th, 1633. Such was the poverty of his parents, that they thought themselves happy in getting him into the service of a man who sold herbs and fruit. There he took every opportunity, though he could not tell one letter from another, to pore on the leaves of some old books that served for waste paper, declaring that he loved it of all things. A neighbouring bookseller, who observed this, took him into his service. Young Magliabechi soon learned to read; and his inclination for reading became his ruling passion, and a prodigious memory his distinguished talent. He read every book that came into his hands, and retained not only the sense of what he read, but often all the words, and the very manner of spelling, if singular. To make trial of the force of his memory, a gentleman lent him a manuscript he was going to print. Some time after it was returned, the gentleman came to him with a melancholy face, and pretended it was lost. Magliabechi being requested to recollect what he remembered of it, *wrote the whole without missing a word, or varying the spelling.* He was consulted by all the learned who proposed to write on any subject. If a priest, for instance, was going to compose a panegyric on a saint, Magliabechi would tell him every author, to the number of an hundred sometimes, who had said any thing of that saint, naming the book and the page, and the very words. He did this so often, and so readily, that he came at last to be looked upon as an oracle; and Cosmo III., Grand Duke of Florence, made him his librarian, the most suitable office to Magliabechi's genius. In the latter part of his life, when a book came into his hands, he

would read the title page all over, dip here and there in the preface, dedication, and prefatory advertisements, if there were any; and then cast his eyes on each of the divisions, sections, or chapters. After this he could tell at any time what the book contained.

Though Magliabechi must have lived a very sedentary life, yet he attained to the age of eighty-one. He died July 14, 1714, in the midst of public applause, after enjoying, during all the latter part of his life, such an affluence as very few persons have ever produced by their knowledge and learning. By his will he left a very fine library collected by himself for the use of the public, with a fund to maintain it, and the overplus of the fund to the poor. It had been usual for every author and printer to make him a present of a copy of every thing they published.—*New Art of Memory.*

THOMAS CARN.

The most remarkable instance of longevity which we meet with in British history is that of Thomas Carn, who, according to the parish register of St. Leonard, Shoreditch, died the 28th of January, 1588, at the astonishing age of two hundred and seven years. He was born in the reign of Richard II. anno 1381, and lived in the reigns of twelve kings and queens, namely, Richard II.—Henry IV., V., and VI.—Edward IV. and V.—Richard III.—Henry VII. and VIII.—Edward VI.—Mary and Elizabeth. The veracity of the above may be readily observed by any person who chooses to consult the above register.—TAYLOR'S *Annals of Health and Long Life.*

THOMAS PARR.

Thomas Parr, son of John Parr, was born at Alderbury, in the parish of Winnington, in Shropshire, in the reign of king Edward IV. anno 1488. When 80 years old he married his first wife, Jane, and in the space of 32 years had but two children by her,

both of them short-lived; the one lived but a month, the other only a few years. Being aged 120, he became enamoured of Katherine Milton, whom he married, and had children by her. Two months before his death, he was brought by Thomas Earl of Arundel, to Westminster, where he slept away most of his time, and is thus characterized by an eye-witness:

> From head to heel, his body had all over,
> A quick-set, thick-set, nat'ral hairy cover.

Change of air and diet, better in itself, but worse for him, with the trouble of many visitants, or spectators, are rather conceived to have accelerated his death, which happened at Westminster, November 15th, 1632, aged 152 years.

This aged man lived in ten reigns, viz., Edward IV., Edward V., Richard III., Henry VII., Henry VIII., Edward VI., Queen Mary, Queen Elizabeth, King James, and Charles I.

GIANTS.

As the tallest ears of corn are the lightest in the head; and houses built many stories high have their uppermost rooms the worst furnished; so those human fabrics, which nature hath raised to a giant-like height, are observed not to have so happy a composition of the brain as other men; like the Pyramids of Egypt, they are rather for ostentation than use, and are remembered in history not for any accomplishments of mind, but only for the magnitude of their bodies.

1. The tallest man that hath been seen in our age, was one named Gabara, who in the days of Claudius the late Emperor, was brought out of Arabia. He was nine feet nine inches high.—*Plin. l.* 7. *c.* 16. *p.* 165. *Solin. c.* 5. *p.* 188

2. Maximus the Emperor was eight feet and a half in height. He was a Thracian, barbarous, cruel, and hated of all men. He used the bracelet or armlet

of his wife as a ring for his thumb, and his shoe was longer by a foot, than that of another man.—*Zuing. Vol.* 2. *l.* 2 *p.* 276. *Capitolin.*

3. Ferdinand Magellan (before he came to those straits which now bear his name) came to the country of the Patagonians, which are giants. Some of these he enticed to come on board his ship. They were of an huge stature, so that the Spaniard's heads reached but to their waist. Two of them he made his prisoners by policy, who thereupon roared like bulls. Their feeding was answerable to their great bulk; for one of them did eat at a meal, a whole basket of biscuits, and drank a great bowl of water at each draught.—*Clark's Mir. c.* 58. *p.* 234. *Purchas. Pilg. Vol.* 1. *p.* 35.

4. In the chapelry of Hale, in Lancashire, was born, in the year 1578, John Middleton, commonly called the "*Child of Hale*," who was remarkable for his largeness of stature and extraordinary strength. It is traditionally reported that one of the Irelands took him to London, and introduced him to the presence of King James the First, dressed up in a very fantastic style. On his return from London, a portrait was taken of him, which is preserved in the library of Brazen-nose College, at Oxford; and Dr. Plott gives the following account of him: "John Middleton, commonly called the Child of Hale, whose hand, from the carpus to the end of the middle finger, was seventeen inches; his palm eight inches and a half; and his height nine feet three inches, wanting but six inches of the size of Goliah."

Numbers of men have grown to the height of upwards of eight feet; but the above are the tallest we have heard or read of.

DWARFS.

In the preceding account we had some of the works of Nature written in text. Here we are presented with some of her writing in small characters; wherein

many times she hath been so happy as to comprise much in a little compass. The elephant, though so vast of bulk, is not more curious than the smallest sort of insects, where we behold with equal pleasure and wonder, the springs of life act in those narrow and straight confinements, as regularly as where they have much larger room.

1. Julia, the niece of Augustus, had a little dwarfish fellow, called Coropas, whom she set great store by. He was not above two feet and a hand's breadth in height; and Andromeda, a freed maid of Julia's, was of the same height.—*Plin. lib.* 7. *cap.* 16. *p.* 165.

2. Augustus Cæsar exhibited in his plays one Lucius, a young man born of honest parents. He was not full two feet high, saith Ravisius. He weighed but seventeen pounds, yet he had a strong voice.—*Zuing. vol.* 2. *lib.* 2. *p.* 277.—*Sueton, p.* 81. *in Augusto.*

3. In the time of Iamblicus, lived Alypius of Alexandria, a most excellent logician, and a famous philosopher, but of so small and little a body that he hardly exceeded a cubit, or one foot five inches and a half in height. Such as beheld him would think he was scarce any thing but spirit and soul: so little grew that part of him which was liable to corruption, that it seemed to be consumed into a kind of divine nature.—*Zuing. vol.* 2. *lib.* 2. *p.* 278. *Eunap. in Iamblic. Voss. Instit. lib.* 1. *cap.* 5. § 19. *p.* 72.

4. Jeffery Hudson was born in 1619 at Latham in Rutlandshire. His father was a butcher, of a stout and corpulent frame. His mother was a good size. When pregnant she was not cumbersome, nor did she need a midwife to bring him into the world. At eight years old, being not half a yard in height, he was taken by the Duchess of Buckingham, who clothed him in satin. At a splendid feast given by the Duke, there was a cold pie, which being opened, little Jeffery started up in complete armour. Soon after, he was presented to Queen Henrietta Maria.

It was a strange contrast to see him and the King's gigantic porter, William Evans. In a masque at Court, Evans lugged out of one pocket a long loaf, and little Jeffery, instead of a piece of cheese, out of the other. He was employed upon a kind of embassy to France to bring over the Queen's midwife; and on his return was taken by a Flemish pirate. This captivity of his is celebrated by Sir William Davenant, in a poem called Jeffreidos.—He died about the year 1680, being upwards of 60 years of age.—*Gent. Mag. Dec.* 1734. *Wanley's "Wonders of the Little World."*

5. I have seen some men of a very small stature, not by reason of any crookedness in the spine of the back, or legs, but such as were so from their birth, though straight in all their bones. Of this number was John de Estrix of Mechlen, whom I saw when he was brought through Basil to the Duke of Parma, then in Flanders, anno 1592. He was aged 35; he had a long beard, and was no more than three feet high. He could not go up stairs, much less could he get upon a form, but was always lifted up by a servant. He was skilled in three tongues, ingenious and industrious; with whom I played at tables.—*Plater. Observ. lib.* 3. *p.* 581.

6. Marcus Varus reporteth, that Marius Maximus, and Marcus Tullius, were but two cubits, or two feet eleven inches high, and yet they were both gentlemen and knights of Rome; and, in truth, we ourselves have seen their bodies, as they lie embalmed, which testify the same thing.—*Plin. lib.* 7. *cap.* 16. *p.* 165.

There are a great number of dwarfs, both male and female, whose height does not exceed three feet.

RAIL-ROADS.

NOT only is the importance of steam practically known in almost all our manufactures, but its various properties are felt in every branch of commerce. While we have steam power making a stocking, the same like power is employed in propelling immense ships through a rough and heavy sea, and huge vehicles in the shape of coaches and caravans on rail-roads. The rapidity thus acquired, and the frequent communications with distant parts of the country, are of themselves grand and astonishing considerations, and must set at rest those who doubted the application of steam power to locomotive purposes.

Railways made of wood, were first used at Newcastle about the year 1680, and made of iron at Whitehaven, in 1738. The first *iron* rail-road was laid down at Colbrook Dale in 1786. Near Newcastle, there are 250 miles of iron Railway above ground, and nearly the same beneath. In Glamorganshire there are 300 miles from different coal works and mines, to quays. Thus it will be seen from the latter date, that it has taken a century to complete what at the present day must be one of the most vital improvements. By means of these roads a single horse can perform the work of six or eight horses, and indeed some persons say, ten horses. The friction is 115th part of the load, while on turnpike roads it is from a twelfth to a fifteenth. Steam power to convey coals on a railway, was first employed by Blenkinsop, at Hunslet, near Leeds; and afterwards for passengers and goods on the Stockton and Darlington railway, being the first coach of the kind ever started. The speed was from five to eight miles an hour, and the charge one half, inside passengers paying 1½d. per. mile, and outside 1d.

Rail-roads are called *Tram-ways*, or flat bars, when with a rising rim on the outside, or *edgeways*,

in which the bars present thin breadths to the load. Double railways are generally twenty feet wide.

We have already stated that this country will be completely intersected with rail-roads, we can, therefore, but notice the principle ones :—

LIVERPOOL AND MANCHESTER.

This line of road connects two of the most important towns of the empire; it is about 31 miles long, at nearly a dead level. At the former place it is carried down to the quays by a magnificent tunnel under the town one mile and a quarter long, and a branch of it 290 yards. The whole of this undertaking was under the immediate direction of Mr. Stephenson, the engineer. The distance is performed in about one hour and a half with perfect ease. The cost of this road up to June last was £1,364,907 or £44,029 per mile. Since the opening, little more than eight years, five millions of passengers have passed along the line; out of this immense number *only two passengers* have lost their lives by accident, arising from the sudden collision of some of the carriages.

LONDON TO BIRMINGHAM.

Another important line is now open for public accommodation between the above two places. The distance is reckoned at 112½ miles, which is performed in about four hours and a half.* There is a rise of 256 feet. The different levels require one rise of 315 feet in 15 miles, or eleven minutes only. There are ten tunnels, and two lines, six feet distant, with places for turning out. The travelling rate is averaged at about twenty miles an hour. From statements now before us, the cost already is £40,476 per mile, and before it is completed it will be in-

*In the year 1777, the coach from London to Birmingham was twenty-seven hours on the road!

creased to £49,365. The original estimate was two and a half millions, but the sum already expended is £4,553,558; and it is stated that another million is required, if so it will make the gross amount to be £5,553,558!!

THE GREAT WESTERN.

The intention of this line is to connect the sea-port of Bristol with London, and in fact to have easy access to the principal towns, &c. in the western part of England. The distance is nearly 118 miles, it is not opened further than Maidenhead, as many accidents and obstacles have prevented its completion. The original estimate for it was two and a half millions; but a revised estimate has swelled the computation to £4,568,928, or about £38,886 per mile. There is considerable censure cast upon the Directors for this enormously increased amount, but they account for it by stating that the intended joining with the Birmingham line at Acton has warranted it.

SOUTHAMPTON AND LONDON.

The progress made upon this line is astonishing; it is open as far as Guildford, a distance of thirty miles from London; and the immense number of passengers and luggage availing themselves of it, is truly astonishing. Mr. Giles was the engineer till 1837, when Mr. Locke succeeded him. When the Act of Parliament passed for this line, the estimate was fixed at one million: but shortly after Mr. Locke's undertaking the management, another act was obtained for the creation of additional shares, which would increase the capital to one and a half million. Up to August of this year (1838) it is stated that the expenditure was £1,336,407, and that a further outlay of £450,000 is anticipated as requisite to complete the railway.

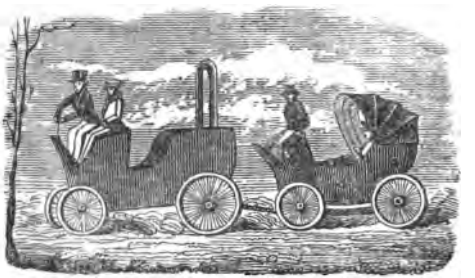
LONDON TO BRIGHTON.

After the immense bustle in Parliament, and the shameless stock jobbing of some of the Directors and Managers of this line of road, we are unable to report the progress—that it has commenced—and is proceeding slowly it is true, but as yet the public are in the dark as to its present expenditure, and anticipated cost.

GREENWICH TO LONDON.

We have anticipated this line to be a failure, that is, provided the line be not extended to Dover; then, indeed, an immense advantage would be obtained both by the public and the projectors. It takes about five minutes to go from London Bridge to the town of Greenwich, at the cost of sixpence—the distance about four miles and a half. Colonel Landmann, the engineer, estimated the cost at £400,000, but the expenditure up to the present period has been £600,000, and a very considerable sum is still required.

A facetious writer has declared that in a few years the whole of England will be like a gridiron with rail-roads. We are disposed to agree with him, for at this present time we have a list before us, containing the names of *thirty-nine*, some completed, others nearly so, and a great many only begun. We are likewise informed that in the next session of Parliament, applications for *new* bills will exceed one hundred! This may be all very well if not carried to too great an extent, by which means as many persons will be ruined by their anxiety to speculate as there were in the great South Sea bubble. Under these circumstances it is the duty of Parliament to reject all those bills having only jobbing for their ends, and swindlers for their projectors.



LOCOMOTIVE CARRIAGE.

LOCOMOTIVE STEAM CARRIAGES.

To render these conveyances of still greater importance to the community, it became necessary to substitute steam for horse labour. Accordingly, a trial of speed was undertaken at Liverpool in October 1829, between two carriages constructed by Braithwaite and Stephenson. Braithwaite's carriage, including water and fuel, weighed 3 tons 14 cwt. Stephenson's carriage 4 tons 3 cwt., with water and fuel in a separate carriage, 1 ton 14 cwt. 3 qrs. Stephenson's ran from 14 to 17 miles an hour, and sometimes 18. Braithwaite's ran 21 miles 1-6th; and, with 45 passengers in a train of waggons, in a second experiment, went 22 miles an hour, and occasionally 32 miles! The carriage, with water, tank, and fuel, together with the persons who accompanied it as judges, weighed 10 tons!

100 tons are drawn by a single railway engine from Manchester to Liverpool in one hour and a half, while a stage waggon would draw but 8 tons the same distance of 30 miles in a day! The Sampson and Goliah, two engines on the Manchester railway, undertook to convey a thousand bags of New Orleans cotton from Liverpool to Manchester. They started together from Liverpool at eight o'clock, and arrrived at Manchester at half-past eleven. The total number of bags of cotton brought by the two engines was 1095. Of these the Sampson brought 549; and, as each bag of American cotton averages 4 cwt., the following may be considered a correct statement of the Sampson's load:—

	Tons.	Cwt.
549 bags of cotton	109	16
Tares of 30 waggons.....	42	15
Weight of persons on train.....	1	0
——— of engine	8	0
Total	161	11

Besides tenders, coke, water, &c., amounting to several tons more!!

In the year 1831 a Committee of Parliament passed the following resolutions:—

"That carriages can be propelled by steam on common roads, at an average rate of ten miles per hour. That at this rate they have conveyed upwards of fourteen passengers.

"That their weight, including engine, fuel, water, and attendants, may be under three tons.

"That they can ascend and descend hills of considerable inclination with facility and safety.

"That they are perfectly safe for passengers.

"That they are not (or need not be, if properly constructed) nuisances to the public.

"That they will become a speedier and cheaper mode of conveyance than carriages drawn by horses."

They likewise agreed that the wear of roads would not be so great as by common conveyances.

Accordingly Mr. Walter Hancock ran a steam coach between Whitechapel and Stratford. Mr. Gurney ran another of his invention between Cheltenham and Gloucester. Messrs. Braithwaite and Co. another on the Paddington-road. Colonel Macirone another. Sir Charles Dance a very perfect one; and a great many other persons.

On Monday the 22d of April, 1833, the first steam omnibus, by Hancock, ran from the Bank to Paddington. Hancock's coaches ran from ten to fifteen miles an hour; and Gurney's ran 396 journies of nine, in an average of 55 minutes, the whole cost of fuel being but £78 in 3644 miles. Two companies were formed by Hancock, (but subsequently abandoned from some unexplained cause) one for Greenwich and Brighton coaches, and another for Paddington and Hampstead. Their speed was to have been ten or twelve miles an hour, and their consumption of coke a sack to every eight miles. The number of passengers from 20 to 30, at half the

usual fares. Double the power, exerted on a level road, carries one of these carriages up the steepest hills, of from three to four inches of ascent to the yard. Notwithstanding that so many locomotive carriages were invented, and performed the journies with speed and safety, there is not one now running on the turnpike road.

It would require twelve stage coaches, carrying fifteen passengers each, and 1200 horses to take 180 passengers 240 miles in twenty-four hours, at the rate of ten miles an hour. One locomotive steam-engine will take that number, and go two trips in the same time; consequently will do the work of 2,400 horses. Again, it would require thirty mail coaches, six passengers each, and 3,000 horses, to take 180 passengers and mail 240 miles in 24 hours, at the rate of ten miles an hour. One locomotive steam-engine will take that number, and go two trips in the same time; consequently will do the work of 6,000 horses!

A FIGHT OF WILD BEASTS.

A CRUEL experiment was tried when a dragoon's horse, and a bull were turned into an enclosure, where a tiger, a lion, a wolf and a bear had been previously kept in a state of extreme hunger. Immediately on their entrance, the tiger crawled along the ground like a cat, sprung upon the bull's back, and soon brought him down; when the great scramble began, these ferocious animals tearing the bull to pieces, and likewise one another. The wolf and the tiger were first despatched. The lion and the bear had a long and desperate contest. The lion with his teeth and claws, wounded the bear in several places, but could not penetrate much further than the skin. The bear displayed great caution, and, at length took the lion at an advantage, got him within his grasp, and

gave such a squeeze as deprived him of life. The bear, being now master of the field, flew upon the dragoon's horse, which had been grazing the whole of the time; the horse turning his heels to his ferocious assailant, gave him a dreadful kick upon the ribs, which provoked him into fury; and at the second attack, another tremendous kick on the head felled the bear to the ground never more to rise; so that contrary to expectation, the most harmless and inoffensive animal remained master of the field.

THE ELEPHANT.

THE largest elephants are from ten to eleven feet in height, some are said to exceed it; but the average is eight or nine feet. They are fifty or sixty years before they arrive at their full growth; and their natural life is about one hundred and twenty years. Their price increases with their merit during a course of education. Some, for their extraordinary qualities, become in a manner invaluable; when these are purchased, no compensation induces a wealthy owner to part with them.

The skin of the elephant is generally a dark grey, sometimes almost black; the face frequently painted with a variety of colours; and the abundance and splendour of his trappings add much to his consequence. In India the Mogul princes allow five men and a boy to take care of each elephant: the chief of them, called the mahawut, rides upon his neck to guide him; another sits upon the rump, and assists in battle; the rest supply him with food and water, and perform the necessary services. Elephants bred to war, and well disciplined, will stand firm against a volley of musquetry, and never give way unless severely wounded. One of these animals has been seen with upwards of thirty bullets in the fleshy parts of his body, perfectly recovered from his wounds.

All are not equally docile, and when an enraged elephant retreats from battle, nothing can withstand his fury: the driver having no longer a command, friends and foes are involved in undistinguished ruin.

The elephants in the army of Antiochus were provoked to fight by shewing them the blood of grapes and mulberries. The history of the Maccabees informs us, that "to every elephant they appointed a thousand men, armed with coats of mail, and five hundred horsemen of the best; these were ready at every occasion; wherever the beast was, and whithersoever he went, they went also; and upon the elephants were strong towers of wood, filled with armed men, besides the Indian that ruled them."

Elephants in peace and war know their duty, and are more obedient to the word of command than many rational beings. It is said they can travel, on an emergency, two hundred miles in forty-eight hours; but will hold out for a month, at the rate of forty or fifty miles a day, with cheerfulness and alacrity. "I performed," observes Forbes in his Oriental Memoirs, "Many long journeys upon an elephant: nothing could exceed the sagacity, docility and affection of this noble quadruped. If I stopped to enjoy a prospect, he remained immoveable until my sketch was finished; if I wished for ripe mangoes growing out of the common reach, he selected the most fruitful branch, and breaking it off with his trunk, offered it to the driver for the company in the houdah, accepting of any part given to himself with a respectful salam, by raising his trunk three times above his head, in the manner of the oriental obeisance, and as often did he express his thanks by a murmuring noise. When a bough obstructed the houdah, he twisted his trunk around it, and, though of considerable magnitude, broke it off with ease, and often gathered a leafy branch, either to keep off the flies, or as a fan to agitate the air around him, by waving it with his trunk; he generally paid a visit at the tent-door

during breakfast, to procure sugar-candy or fruit, and be cheered by the encomiums and caresses he deservedly met with: no spaniel could be more innocently playful, nor fonder of those who noticed him, than this docile animal, who on particular occasions appeared conscious of his exaltation above the brute creation."

However surprising may be the docility of this noble animal, when tamed, its sagacity, in a savage state even, is a subject of still greater wonder, as is evidenced by the following narrative extracted from Lichtenstein's travels in Southern Africa. Two individuals, named Müller and Prince, being engaged, in the Caffre territory, where these animals abound, in an elephant hunt, discoverd the footsteps of a very large elephant, and soon espied the animal himself on the declivity of a naked and widely outstretched hill. It is a rule, when an elephant is thus found, to endeavour to get above him on the hill, to the end that, in case of necessity the hunter may flee to the summit, whither the animal, on account of the unwieldiness of its body, cannot follow him fast. This precaution was neglected by Prince who shot too soon, while they were yet at too great a distance, and the elephant on higher ground than himself and his companion. The wounded animal rushed down towards them, while they endeavoured to push their horses on, and gain the brow of the hill. Being able, on favourable ground, to run as fast as a horse, he soon came up with them, and struck with his tusk at Müller's thigh, he being the nearest of the two fugitives. Müller now considered his fate as inevitable, as he endeavoured in vain to set his almost exhausted horse into a gallop, and saw the animal, after giving a violent snort, raise his powerful trunk above his head. It was not, however, on himself, but on his companion, that the stroke fell: and in an instant he saw him snatched from his horse, and thrown up into the air. Scarcely in his senses, he continued his flight, and

only in some degree recovered himself by finding Prince's horse running by his side without a rider: then looking back, he saw his unfortunate friend on the ground, and the elephant stamping upon him with the utmost fury. He was now convinced, not without the greatest astonishment, that the sagacious animal had distinguished which of the two it was who wounded him, and wreaked his whole vengeance upon him alone. Müller, on this, went in search of the rest of the party, that they might collect the mangled remains of their companion, and bury them; but they were soon put to flight by the elephant rushing again from a neighbouring thicket, to vent his wrath once more upon the corpse, already so dreadfully mangled. While he was busied in doing this, however, he was attacked by the dispersed hunters, and sacrificed to the manes of his unfortunate victim.

The contrivances for taking elephants are various; but the most curious are those employed by the natives of Ceylon, where the finest race of these animals is found. They sometimes surround the woods in bands, and drive with lighted torches, amid the clamour of trumpets, the discharge of fire-arms, and noises of every description, the elephants which inhabit them, till they are at length entrapped into a particular spot surrounded with palisadoes, so as to prevent all escape. At other times a kind of decoy, or female elephant, is sent out in order to induce some of the males to pursue her, who are by that means secured. When a wild elephant is taken, it still remains to reduce it to a quiet state, and to tame it, in order to its being made useful: this is effected by throwing ropes round the legs and body, which are well secured; and two tame elephants, properly instructed, are placed on each side. The captive animal finds himself gradually so fatigued by his ineffectual struggles, and so much soothed by the caresses occasionally given by the trunks of the tame

elephants, by the food from time to time presented to him, and the water with which he is refreshed by its being poured over him, that in the space of a few days, unless more than usually untractable in his nature, he becomes completely tame, and is placed with the rest of the domesticated troop. Sometimes, in order more effectually to subdue them, the elephants are deprived of sleep for a considerable time.

The anecdotes recording the sagacity, and also the amiable qualities of the elephant, are numerous. Of these the following are selected as highly interesting. In Delhi, an elephant passing along the streets, put his trunk into a tailor's shop, where several persons were at work. One of them pricked the end of the trunk with his needle; the beast passed on; but at the next dirty puddle filled his trunk with water, returned to the shop, and spurting it among those who had offended him, spoiled their work.—At Adsmeer, an elephant who often passed through the bazaar, or market, as he went by a certain herb-woman, always received from her a mouthful of greens: at length he was seized with one of his periodical fits of rage, broke his fetters, and, running through the market, put the crowd to flight, and, among others, this woman, who, in her haste, forgot a little child she had brought with her. The animal recollecting the spot where his benefactress was wont to sit, took up the infant gently on his trunk, and placed it in safety on a stall before a neighbouring house.—At the same place, another elephant, in his madness, killed his *cornac*, or governor: the wife, witnessing the misfortune, took her two children, and flung them before the elephant, saying: "now you have destroyed their father, you may as well put an end to their lives and mine." It instantly stopped, relented, took the eldest of the boys, placed him on his neck, adopted him for his governor, and never afterwards would permit any other person to mount him.—A painter was desirous of drawing the elephant kept in the menagerie at

Versailles, in an uncommon attitude, namely, that of holding his trunk raised up in the air, with his mouth open. The painter's boy, in order to keep the animal in this posture, threw fruit into his mouth; but as the lad frequently deceived him, and made an offer only of throwing the fruit, he grew angry; and, as if he had known that the painter's intention of drawing him was the cause of the affront thus offered, instead of avenging himself on the lad, he turned his resentment on the master, and taking up a quantity of water in his trunk, threw it on the paper on which the painter was drawing, and spoiled it.

Elephants now personate the principal characters in dramas, on the stages of many of our theatres.

STATISTICS AND MECHANICS.

ANIMALS, in civilized countries, increase the labouring and productive powers of man to four and a-half times what man could perform alone.

A body, moving down an inclined plane, moves four times as far in two seconds as in one.

Cotton-spinning machinery, and manufacturing machinery in general, are merely varieties of the inventions of Androides, and toy-makers. A central power, with axles, wheels, cogs, ketches, ratches, straps, lines, levers, screws, &c. &c. variously combined, to reverse, direct, take up, drop, increase, and decrease motion, constitute the wonders of Lancashire, Yorkshire, and Warwickshire.

Chronometers, for nautical and astronomical purposes, are now made with such precision, that they do not vary from true time more than two or three seconds in a year!

Brunel's block-machine unites the action of sixteen different machines in one steam engine—7 for the shell, and 9 for the sheave. 10 men do the work of 110. It makes about 200 sorts and sizes of blocks:

—i. e. 72 sizes of thick blocks, 48 of thin blocks, 10 of clue-line ditto; 20 sister blocks, 20 top-sail ditto, 24 fiddle ditto, 20 jack ditto. Of which varieties the machines make 1420 blocks per day. Brunel has also invented a saw mill, now in use at Chatham, with a 36 horse engine, and 10 or 12 hands, without horses, perform the labour of 50 saw pits. It takes the timber from the vessels, and delivers the sawn planks to the stacks!

By the machinery at Weevil near Portsmouth, eight men and two boys manufacture 90 cwt. of biscuits in an hour and a half; less time than ten men, by the old method, manufactured 36 cwt.

In Derbyshire, a sheet of paper has been made 13,800 feet long, and 4 wide.

A Lock has recently been made with 24 moveable letters, so as to spell any word, and no key will open it, but those adjusted to that word.

A dredging machine raises in four hours of each tide 960 tons of gravel per day; or, on a clay bottom, about half that astonishing quantity in its buckets.

A pin making machine has been set up at Stroud, which makes pins with solid heads, from the wire to the polishing, without the interference of the hand. A water wheel of 40 horse power, works 100 several machines which produce 4500 lbs. of pins per week, or 19 millions of pins.

The smallest quantity of water balances any quantity however great, on the principle of finding its level; hence if a long pipe be inserted in a butt of water, however small its bore, it will burst the butt as though it had been blown up with gunpowder. Braham's press is made on this principle, and a column of water half an inch diameter, acting on a square foot of water, produces 576 tons pressure, or upon a yard in diameter of 41,172 tons, and is made to act so as to bear upon any substance.

Wood, sunk to a great depth, is brought up heavier than water, by the saturation of pressure.

ANIMAL INSTINCT.

A SEAMAN belonging to the wood party of a ship, upon the African coast, by some means found himself alone. He however continued to use the axe, in felling a large tree, when a large lioness approached him. The man, at the moment gave himself up as lost; but very soon afterwards he began to perceive that the manner and expression of the animal were mild, and even mournful, and that he had no danger to apprehend from her. She first looked at him and then behind her, and upwards into the trees, then went a few paces from him upon the path by which she had come: and then returned, and went again; and acted much as a dog would that wished you to follow him. The seaman yielded to her obvious desire, and she led him some little distance, till, near the foot of a tall tree, she stopped, and looked up, with plaintive cries, into its branches. The sailor, thus directed, looked into the tree, and soon discovered at a considerable height, an immense ape, dandling and playing with a cub lion, which he had carried thither for his amusement! The wants and wishes of the lioness were now easily understood. The lion species, though usually reckoned among the species of cat, differ absolutely from it in this as in many other particulars, that it cannot ascend a tree, a distinction by the way, which ought to satisfy us at once of the error of those who talk to us of lions in America, where in reality there is no lion, and where the *puna* and *jaguar*, which they call lions, so readily ascend trees. But equally in vain would it have been for the sailor to climb after the cub, for the ape, would have enjoyed the frolic by leaping with its prey from branch to branch; so the only chance was to apply the axe at the bottom of the tree. To work, therefore he went, the lioness, which had seen other trees felled by the axe of the stranger, standing by, and impatiently awaiting the event. The ape kept

his seat till the tree fell, and then fell with it; and the lioness, the moment the robber reached the ground, sprang upon him with the swiftness and sureness of a cat springing upon a mouse, killed him, and then, taking her cub in her mouth, walked contentedly away from the benefactor, to whose skill and friendly assistance she had made her friendly appeal!

MECHANISM.

CURIOUS CLOCK AT STRASBURGH

At Strasburgh there is a clock of all others the most famous, invented by Conradius Dasipodius, in the year 1571. Before the clock stands a globe on the ground, showing the motions of the heavens, stars, and planets. The heavens are carried about by the first mover, in twenty-four hours. Saturn, by his proper motion, is carried about in thirty years; Jupiter in twelve; Mars, in two; the Sun, Mercury, and Venus, in one year, and the Moon in one month. In the clock itself there are two tables on the right and left hand, showing the eclipses of the sun and moon from the year 1573 to the year 1624. The third table in the middle, is divided into three parts. In the first part the statues of Apollo and Diana show the course of the year, and the day thereof, being carried about in one year; the second part shews the year of our Lord, and the equinoctial days, the hours of each day, the minutes of each hour, Easter day, and all other feasts, and the dominical letter. The third part hath the geographical description of all Germany, and particularly of Strasburgh, and the names of the inventor and all the workmen. In the middle frame of the clock is an astrolabe, shewing the sign in which each planet is every day; and there are the statues of the seven planets upon a

round piece of iron, lying flat; so that every day the planet that rules the day comes forth, the rest being hid within the frames, till they come out by course at their day; as the sun upon Sunday, and so for all the week. And there is also a terrestrial globe, which shows the quarter, the half-hour, and the minutes. There is also the skull of a dead man, and statues of two boys, whereof one turns the hour-glass, when the clock hath struck, the other puts forth the rod in his hand at each stroke of the clock. Moreover, there are the statues of Spring, Summer, Autumn, and Winter, and many observations of the moon. In the upper part of the clock are four old men's statues, which strike the quarters of the hour; the statue of Death comes out at each quarter to strike, but is driven back by the statue of Christ, with a spear in his hand, for three quarters, but in the fourth quarter, that of Christ goes back, and that of Death strikes the hour with a bone in his hand, and then the chimes sound. On the top of the clock, is an image of a cock, which twice in the day crows aloud, and claps his wings. Besides, this clock is decked with many rare pictures; and, being on the inside of the church, carries another frame to the outside of the wall, wherein the hours of the sun, the courses of the moon, the length of the day, and such other things, are set out with great art.—MORRISON'S *Itinerary*.

AUTOMATON TARANTULA SPIDER.

This surprising piece of mechanism, made of steel, was exhibited at Weeks's museum, Titchborne-street, Piccadilly. This singular automaton comes independently out of a box, and runs backward and forward on a table; stretches out and draws in its paws, as if at will; moves its horns and claws, and opens them with ease.

This wonderful little figure must fix the attention of the curious, having no other power of action than

the mechanism contained in its body. The thing might have been thought impossible, on account of its smallness, and the difficulty of putting together, it being composed of *one hundred and fifteen* different pieces.

AUTOMATON OPERA.

Towards the end of the 17th century, Father Truchet, of the Royal Academy of Sciences, constructed for the amusement of Louis XIV., an automaton, consisting of a kind of moving pictures, which was considered as a masterpiece in mechanics. One of these pictures, which the monarch called his *little opera*, represented an opera in five acts, and changed the decorations at the commencement of each. The actors performed their parts in pantomime. This moving picture was only 16½ inches in breadth, 13 inches 4 lines in height, and one inch three lines in thickness for the play of the machinery. The representation could be stopped at pleasure, and made to re-commence at the same place by the operation of a catch.—*Edinburgh Encyclopædia.*

AUTOMATON COACH AND HORSES.

A more extraordinary piece of mechanism than the foregoing, is that described by M. Camus, who says he constructed it for the amusement of Louis XIV., when a child. It consisted of a small coach drawn by two horses, in which was the figure of a lady, with a footman and page behind. According to the account given by M. Camus himself, this coach being placed at the extremity of a table of a determinate size, the coachman smacked his whip, and the horses immediately set out, moving their legs in a natural manner. When the carriage reached the edge of the table, it turned on a right angle, and proceeded along that edge. When it arrived opposite to the place where the king was seated, it stopped, and the page getting down, opened the door, upon

which the lady alighted, having in her hand a petition, which she presented with a curtsey. After waiting some time, she again curtsied, and re-entered the carriage; the page then resumed his place, the coachman whipped his horses, which began to move, and the footman, running after the carriage, jumped up behind it, and the carriage drove on.—*Edinburgh Encyclopædia.*

WRITING AUTOMATON.

M. Maillardet constructed a writing boy, who is exhibited kneeling on one knee, and an attendant having dipped his pencil and laid the paper before him, he executes drawings, and French and English sentences, in writing, of a very superior description. Every natural motion of the fingers, elbows, eyes, &c. is correctly imitated. The first of these figures the artist stated to have cost him the sum of £1,500 in its construction.

THE SPEAKING MACHINE.

We have often heard it said, of a clever automaton, "it can do every thing but talk;" we are now to have one, it seems, that can do even that. The *Carlsruhe Gazette* mentions a piece of mechanism which perfectly imitates the voice of a child, and produces distinctly every word with its proper undulation. The mechanism, it says, is very simple, consisting of sixteen levers answering to the sixteen simple sounds, moved by so many keys, like those of a harpsicord, so that these, properly touched, produce any articulate sounds required.

ARITHMETICAL INSTRUMENT.

A man named Louis Torchi, a Milanese cabinet-maker, has constructed a machine which performs the three first rules of arithmetic. The Institute of Milan has awarded him a gold medal for the invention. The *Milan Gazette* gives a description of this

instrument, which resembles a small organ with various cylinders.

AUTOMATON DUCK.

Vaucanson made an artificial duck, which performed every function of a real one, even an imperfect digestion, eating, drinking, and quacking.

The Automaton Chess Player is a wonderful piece of mechanism; besides a great many others, which would take up too much room to particularize.

THE APE TRIBE—APES—BABOONS—AND MONKEYS.

THE animals of this extensive tribe are usually arranged in three divisions, of Apes, Baboons, and Monkeys.—Apes are destitute of tails. They walk upright, and their hands and feet nearly resemble those of men. They are mild and gentle, and they imitate human actions more closely, and are susceptible of greater attainments, than any other of the same tribe.—Baboons have short tails, and generally walk on all fours. Some baboons are as tall as men, have long faces, sunken eyes, and are extremely disgusting in their appearance, and are, for the most part, sullen and ferocious.—Monkeys have tails, in general, longer than their bodies. They are lively, agile, full of frolic, chatter, and grimace. From the structure of their members, they have many actions in common with the human kind. Most of them are fierce and untameable. Some are of a milder nature, and will show a degree of attachment; but, in general, they are endowed with mischievous intellects, and are therefore filthy, obscene, and lascivious. They inhabit the woods, and live on trees, feeding on fruits, leaves, and insects. In general they are gregarious, going in vast companies; but the different

species never mix with each other, always keeping apart, and in different quarters. They leap with vast activity from tree to tree, even when loaded with their young, which cling to them. They are the prey of leopards, and others of the feline race, and of serpents, which pursue them to the summits of the trees, and swallow them entire. They are not carnivorous, but, for mischief's sake, will rob the nests of birds of the eggs and young. In the countries where they most abound, the sagacity of the feathered tribe is most marvellously shown, in their contrivances to fix the nest beyond the reach of these invaders.

Monkeys generally live in extensive troops, and some naturalists have asserted that they form a sort of republic, in which a certain degree of discipline is kept up; that they always travel in order, conducted by chiefs, who are the most experienced animals of their troop. The negroes of Africa believe these animals to be a vagabond race of men, who are too indolent to construct habitations, or to cultivate the ground.

In many parts of India, says Mr. Bingley, apes and monkeys are made objects of worship by the natives, and temples of the greatest magnificence are erected in honour of them. Their numbers are almost infinite. They frequently come in troops into the cities, and enter the houses at all times with perfect freedom. In Calicut, however, the inhabitants contrive to keep them out of their dwellings; but to effect this, they are compelled to have all their windows latticed. In Armadabad, the capital of Guzzerat, there are three hospitals for animals, where sick and lame monkeys are fed and cherished.

The Ourang-outangs on the banks of the Ganges, are larger and more mischievous than in any part of Africa. The negroes dread them, and cannot travel alone in the country without running the hazard of being attacked by these animals, who often present them with a stick, and force them to fight. The

Portuguese say, that they often hoist up young girls, from seven to twelve years old, into trees, who are wrested from them not without much difficulty. Most of the negroes imagine they are a foreign nation come to inhabit their country, who do not speak for fear of being compelled to work. When taken young, they are capable of being tamed, and taught to perform many menial offices. In Sierra Leone is a species so strong-limbed, and so industrious, that, when properly trained and fed, they work like servants. These generally walk on the two hind feet—pound any substances in a mortar—go to bring water from the river in small pitchers, which they carry full on their heads. But when they arrive at the door, if the pitchers are not soon taken off, they allow them to fall, and when they perceive the pitchers overturned and broken, they weep bitterly. They are taken with snares, taught to walk on their hind feet, and to use their fore feet as hands in performing different operations, as rincing glasses, carrying drink round to the company, turning a spit, &c.

Buffon saw an ourang-outang that was mild, affectionate, and good-natured. His air was melancholy, gait grave, and movements measured, dispositions gentle, and very different from those of other apes. He had neither the impatience of the Barbary ape, the maliciousness of the baboon, nor the extravagance of the monkey. It may be alleged that he had the benefit of instruction; but the other apes were educated similarly. Signs and words were alone sufficient to make him act; but the baboon required a cudgel, and the other apes a whip, for not one of them would obey without blows. This animal would present his hand to conduct his visitors, and walk as gravely along with them as if he had formed a part of the company. He would sit down at table, unfold his towel, wipe his lips, use a spoon or a fork to carry the victuals to his mouth, pour his liquor into a glass, and make it touch that of the person who drank

along with him. When invited to take tea, he brought a cup and a saucer, placed them on the table, put in sugar, poured out the tea, and allowed it to cool before he drank it. All these actions he performed without any other instigation than the signs or verbal orders of his master, and often of his own accord. He did no injury to any person; he even approached company with circumspection, and presented himself as if he wanted to be caressed. He lived one summer at Paris, and died in London the following winter.

M. de la Brosse, a French navigator, who was in Angola in the year 1718, and who purchased from a negro two ourang-outangs, remarks, that these animals would sit at table like men, and eat there every kind of food without distinction; that they would use a knife and fork, or spoon, to cut or lay hold of what was put on their plate; and that they drank wine and other liquors. At table, when they wanted any thing, they easily made themselves understood to the cabin-boy; and when the boy refused to answer their demands, they sometimes became enraged, caught him by the arm, bit and threw him down. The male was seized with sickness, and he made the people attend him as if he had been a human being. He was even bled twice in the right arm; and whenever afterwards he found himself in the same condition, he held out his arm to be bled, as if he knew that he had formerly received benefit from the operation.

Buffon describes a female ourang-outang, from the island of Borneo, which was brought alive into Holland in 1776, and lodged in the Menagerie of the Prince of Orange. She was extremely gentle, and exhibited no symptoms whatever of fierceness or malignity. She had a somewhat melancholy appearance, yet loved to be in company, and particularly with those persons to whose care she was entrusted. One morning she contrived to escape from her chain,

and, soon afterwards, was seen ascending the beams and oblique rafters of the building, with wonderful agility. With some trouble she was retaken: but the efforts of four men were found necessary to secure her. Two of these seized her by the legs, and a third by the head, whilst the other fastened the cord round the body. During the time she was at liberty, she had taken the cork from a bottle of Malaga wine, drank the wine to the last drop, and then set the bottle again in its place. She would eat of almost every kind of food that was given to her; but she lived chiefly on bread, roots, and fruit. Carrots and strawberries she was peculiarly fond of, as well as of several kinds of aromatic plants, and of the leaves and root of parsley. She also ate meat, both boiled and roasted, as well as fish; and was fond of eggs, the shells of which she broke with her teeth, and then emptied by sucking out the contents. When strawberries were given to her on a plate, it was amusing to see her take them up, one by one, with a fork, and put them into her mouth, holding at the same time the plate in the other hand. Her usual drink was water; but she would also eagerly drink all sorts of wines, particularly Malaga. After drinking, she wiped her lips; and after eating, if presented with a toothpick, she would use it in a proper manner. One day, seeing the padlock of her chain opened with a key, and shut again, she seized a little bit of stick, and put it into the key-hole, turning it about in all directions, examining to ascertain whether the padlock would not open.—*Shaw's Nature Displayed.*

THE STEAM ENGINE.

We are necessarily compelled to give only an *idea* of the powers of steam, in this place, as to do justice to the magnitude and importance of this wonderful discovery, would compel us to extend the disserta-

tion to some folio volumes—we have therefore endeavoured to compress the most important points for the wonder and admiration of our readers.

It was observed by Belider, long before the steam engine reached the perfections it has now acquired, that it strongly resembled an animal; and no mere work of man ever approached so near to actual *life*. Heat is the principle of its existence. The boiler acts the part of the heart, from which its vivifying fluid rushes copiously through all the tubes, where, having discharged the various functions of life, and deposited its heat in the proper places, returns again to the source it sprung from, to be duly prepared for another circulation. The healthfulness of its action is indicated by the regularity of its pulsations; it procures its own food by its own labour. The variation in the performance of different steam engines, is the same as would be found in the produce of the labour of so many different horses, or other animals, when compared with their consumption of food: for the effects of different steam engines will vary as much from the small difference in the proportions of their parts, as the strength of animals from the vigour of their constitutions; and again, there will be as great a difference in the performance of the same engine, when in good or bad order, from all the parts being well oiled, as there is in the labour of an animal, from his being in good or bad health or, excessively fatigued.

The first person who considered the properties of steam philosophically was M. Papin, a physician, born at Blois, who visited England in 1680, and became curator of the Royal Society. The *Digester* which he constructed next year, exemplified the enormous elastic force that steam acquires when heated and confined. As a source of power he proposed atmospheric pressure, by forming a vacuum, either by the inflammation of gunpowder or the condensation of steam. Precluded by the revocation of

the Edict of Nantes from returning to France, he accepted, in 1687, an invitation from the Prince of Hesse to a chair in the university of Marburg. There he extended his plans, but found no help to carry them into execution. The superior skill of English artists transferred the palm of invention. Newcoman, a blacksmith, and Cawley, a glazier, natives of Dartmouth in Devonshire, by their united studies and labours, produced the atmospheric or fire engine in 1705; but, to prevent opposition, they associated in their patent a naval officer, of the name of Savoy, who had a few years before contrived a very imperfect machine, which acted however by alternate expansion and condensation. Accident suggested the injection of cold water within the steam vessel, instead of external affusion. A boy named Potter enabled the engine to work its own valves, by means of strings fastened to the beams. The hint was improved by Beighton, who simplified the opening and shutting of the valves, and improved the whole system of machinery; and in the course of half a century, the fire engine was adopted for raising water in all the coal mines. At this epoch the genius of Watt, guided by sound judgment, and urged by unremitting application, effected, in less than forty years, a complete change in the powers of mechanism. To a person named Smeaton, we are also indebted for many vast improvements.

Watt's first patent was taken out in 1769, and renewed till 1800. He began with performing the condensation in a vessel distinct from the working cylinder; and he next excluded atmospheric pressure, and merely employed the alternate action of expanding and contracting steam. Numerous other improvements are being daily made, which the immediate and constant use of these machines has suggested.

Having thus briefly brought the invention down to so late a period, we shall merely give some ideas

as to the power, cost, capabilities, and utilities of those ponderous vehicles.

Steam is rarefied water *(see water)*, the particles of which are expanded by their mutual circular motions, and the expansion is as the orbits described by the atoms, which orbits are as the first excitement.

Sixteen pounds of Newcastle coals converts one hundred weight of water into steam. A bushel of coals per hour, raises steam to 15lbs. the square inch, whose velocity is 1350 feet per second. And two bushels raise it to 120lbs., or velocity of 3800 feet per second. A horse power requires from five to seven gallons of water per minute for condensation of steam. A steam engine, whose cylinder is 31 inches, with 17 double strokes per minute, performs the constant work of 40 horses with five tons of coals per day. One of 19 inches and 25 strokes, of 12 horses, with a ton and a half of coals per day. They raise 20,000 cubic feet of water 24 feet for every one hundred weight of coals. One bushel of good coals raise from twenty-four to thirty-two millions pounds one foot per minute. Four bushels of coals per hour, with a cylinder of 31½ inches and 17½ strokes of seven feet per minute, is a force equal to forty horses constantly. A rotative double engine, with a cylinder 23.75 inches, making 21.5 strokes of five feet per minute, is a twenty horse power; and a cylinder 17.5, making 25 strokes of four feet, is a ten horse power: the consumption of coals being proportional.

The power of a steam engine twists the largest cables, and spins cotton thread 150 miles to the pound, by the intervention of wheels and cross bands for decreasing or increasing speed.

Horse power in steam engines is calculated as the power which would raise 33,000lbs. a foot high in a minute, or 90lbs. at the rate of four miles an hour. One horse power is equal to the lifting by a pump of 250 hogsheads of water, ten feet in an hour. Or

it would drive 100 spindles of cotton yarn twist; or 500 spindles of No. 48 mule yarn, or 1000 of No. 110, or twelve power looms. One horse power is produced by 16lbs. of Newcastle coals; 50lbs. of wood, or 34lbs. of culm. Coals 1, wood 3, and culm 2, give equal heats in the production of steam.

There are now in this country not less than 15,000 steam engines at work, some of 1000 horse power. Taking it that on an average, these engines are each 25 horse power, this would be equal to 375,000 horses. Five men and a half are equal to the power of a horse; we have thus, therefore, a power, through the medium of steam engines, equal to near two millions of men. Each horse for his keep per year requires the produce of two acres of land, and thus 750,000 acres are at the disposal of the inhabitants, more than if the same work, which is now done by steam, were performed by horses!

The most powerful steam engine in England, is that erected at Hawkesbery Colliery, near Coventry. Its cylinder is 58 inches in diameter; the piston moves 8 feet in a stroke, and makes 12 strokes in a minute; the pump is 14 inches in diameter, and the lift is 65 fathoms, or 390 feet.

EARTHQUAKES.

THIS extraordinary phenomenon in its extent and consequences is far superior to every other effort of nature. Hurricanes, thunder-storms, volcanoes, inundations, &c. are trifling when compared with this, and they often are the auxiliaries or attendants of this desolating operation.

The ancients, with Anaxagoras, supposed that earthquakes were produced by subterraneous clouds bursting out into lightning, which shook the vaults that confined them.

Later authors, as Kircher, Des Cartes, &c. sup-

posed that there were many vast cavities under ground which have a communication with each other, some of which abound with waters, others with vapours and exaltations, arising from inflammable substances, as nitre, bitumen, sulphur, &c. These combustible exhalations they supposed to be kindled by some active flame gliding through a narrow fissure from without, or by the fermentation of some mixture; and when this happened, they must necessarily produce impetuous tremors and ruptures at the surface of the earth. This hypothesis was illustrated by a variety of experiments, such as mixtures of iron filings and brimstone buried in the earth, gunpowder confined in pits, &c. by which a shaking of the earth will be produced.

These ideas continued to be supported till 1749, when an earthquake was felt at London, and several parts of Britain. Dr. Stukely, who had been engaged in electrical experiments, began to suspect that a phenomenon of this kind ought to be attributed not to vapours or fermentations, generated in the bowels of the earth, but to electricity. These principles at the same time were advanced by Signior Beccaria, without knowing any thing of Dr. Stukely's discoveries, and this hypothesis has been supported and confirmed by the experiments of the indefatigable and ingenious Dr. Priestley. In many cases, however, it appears probable that the immense power of water converted into steam by subterraneous fires, must contribute to augment the force which occasions earthquakes.

The following observations have been made relating to earthquakes. 1. Where there are volcanoes, earthquakes may be more frequently expected than in countries where there are no burning mountains. 2. If a volcano has been longer quiet than usual, shocks of an earthquake may be expected, and the contrary. 3. Earthquakes are generally preceded by a long continuance of dry weather. 4. They are

also preceded by electrical appearances in the air, as the aurora borealis, falling stars, &c. The earthquakes that were felt in London and various parts of Britain in 1749 and 1750, were preceded by these appearances. The weather for 5 or 6 months before, had been very warm and dry, with the wind at S. and S. W. The aurora borealis had made uncommon appearances, also fire balls, lightning, &c. had been frequent. 5. Before the shock, the sea generally swells and makes a great noise, and the fountains are troubled. 6. The air at the time of the shock is generally calm and serene; but afterwards commonly obscure and cloudy. 7. The shock comes on with a rumbling noise, sometimes like that of carriages, sometimes a rushing noise like that of wind, and sometimes like that of firing of cannons. The ground rises up perpendicularly, sometimes it rolls or heaves from side to side. A single shock is but of short duration, the longest scarcely lasting a minute; but they frequently succeed one another at short intervals for a considerable time. 8. During the shock, chasms are made in the earth, from which sometimes flames, and often great quantities of water, are discharged; and flames and smoke arise out of the earth where no openings are visible. Sometimes these chasms are small, at other times of vast extent, swallowing up cities, mountains, islands, &c. 9. The water of the ocean is effected like the land, swelling to a prodigious height, and dividing as it were to the bottom, rising up on each side like mountains, air, flames, and smoke issuing from it.

These and other circumstances have been observed as consequent and attendant on earthquakes. The first considerable earthquake on record is mentioned by Pliny, it happend A. D. 17, and destroyed 12 cities in Asia. The second destroyed 150 cities in Asia and Greece, and happened in 358. In 1182, most of the cities in Syria and Judea were destroyed by the same accident. A dreadful earthquake hap-

pened at Calabria in Naples, in 1638, the particulars of which are recorded by the celebrated Father Kircher. Another earthquake was felt at Sicily, in 1693, but its motion extended through Germany, France, England, &c. to the extent of 7600 miles, chiefly affecting the sea coasts and great rivers. Port Royal in Jamaica, was destroyed and sunk in a gulph 240 feet deep in the space of about two minutes, by an earthquake, in 1692. In Lima in S. America and parts adjacent, earthquakes have been very frequent. The last was on the 28th Oct. 1746, about 10 at night, whereby the greatest part of the city was destroyed in less than three minutes. On the first of Nov. 1755, at 35 minutes past nine in the morning, an extensive and destructive earthquake nearly destroyed the rich and flourishing city of Lisbon, this city, before the earthquake, was supposed to contain 24,000 houses, many of six or seven stories: Mr. Baretti computes that two thirds of the houses were levelled with the ground, and 90,000 of the inhabitants supposed to have perished on this fatal day: such houses as withstood the shock were considerably shattered.

Imagination can scarcely form a scene of confusion, horror and death, more dreadful than this. After the shocks of the earth had subsided, the fire continued raging for many weeks, by which the pestilential air, produced from the numerous dead bodies, was purified, and those that survived, preserved their health amidst the putrefactions. This earthquake was felt in Spain, Switzerland, Germany, Norway, Sweden, Holland, Great Britain and Ireland; Morocco, Algiers, &c. in Africa, and in several parts of the West Indies. Various vessels at a great distance from land felt its effects. It extended over a tract of at least four millions of square miles.

But the earthquakes that happened in Italy and Sicily, in 1783, although confined in their extent, seem equally violent. Sir William Hamilton, British minister at the court of Naples, gave a very mi-

nute account of their dreadful effects and appearances. The shocks began on the 5th of February, and continued at different times till the 1st of March, during which time the face of Calabria, lying between the 38th and 39th degree, was entirely altered, hills had been swallowed up, others lowered; huge mountains split asunder, and parts of them driven to a considerable distance; vallies filled up, the course of rivers altered, springs dried, and new ones formed. At Laureana, in Calabria Ultra, two tenements, with large plantations, situated in a level valley, were detached by the earthquake, and transplanted with the trees still remaining in their places, to the distance of about a mile from their first situation; and from that spot on which they formerly stood, hot water mixed with sand sprung up to a considerable height. At Scylla, on the first shock of the 5th of February, the inhabitants fled with their prince at their head, towards the sea-shore, where they hoped for safety; but in the night a furious wave said to be boiling hot, came rolling in, overflowed the land for three miles, and swept off 2473 of the inhabitants, with the prince who was on the shore. But the most singular of all the phenomena enumerated in these accounts, was that of a hill about 500 palms high, (supposing the palm at 4 inches), or about 166 feet, and 433 feet in circumference at the base, transported to the distance of about four miles from the place where it formerly stood. At the same time, the hill on which Oppido stood, which extended three miles, parted in two; and, as its situation was between two rivers, both of these were of course stopped up; and two great lakes were formed. The volcano of Stromboli, on an island of the same name, distant 50 miles from Pizzo in Calabria, which is constantly on fire, emitted less flame and smoke, during the earthquakes than it had done for some years before. The town of Rosarno, and the duke of Monteleone's palace there, were entirely ruined, except the town-gaol.

The town of Polistene was destroyed, and out of 6000 inhabitants 2000 lost their lives. At Casal Nuova, the princess Gerace Grimaldi, with 4000 of her subjects, perished on the same day with the former, viz. the 5th of February. Some who were dug out alive, told our author that they felt their houses quite lifted up, without having the least previous notice. This town was so completely destroyed that not a vestige of a house or street remained, but all lay in one confused mass of ruins. In Terra Nuova only 400 out of 1600 were left behind. At Seminaria 1400 lives were lost. The town, being a great market for oil, there were upwards of four thousand barrels of that liquid in it at the time of its destruction; so that by breaking of these barrels and jars, a rivulet of oil ran from the ruins for many hours into the sea. Here our author was informed by the person who conducted him, that he had been buried in the ruins of his house by the first shock; and that after the second, which followed immediately, he found himself sitting astride on a beam at least 15 feet high in the air.

These earthquakes continued most severe in the month of February, 1783, during which time Sir William Hamilton is of opinion, that including strangers, the number of lives lost could not be fewer than 40,000; feebler shocks occurred during the whole of 1783, within short intervals, but attended with small damage, nor were they perfectly settled when Sir William wrote his account in 1784.

During these scenes, no particular eruption happened either of Etna or Vesuvius.

VELOCITY OF STEAM BOATS.

THE immense increase of power requisite to obtain a small increase of velocity, ought to have its influence in determining the speed of a steam boat during

a long voyage, and its proportions ought to be adapted to the speed, with a small excess of power for emergencies. The power required to give a boat different velocities in still water is as follows:—

Miles.	Horse Power.
3 per hour	5½
4	13
5	25
6	43
7	69
8	102
9	146
10	200

The mechanical power, or power of a steam engine to impel a boat in still water, must be as the cube of the velocity. Therefore, if an engine of twelve horse power will impel a boat seven miles per hour, it will require one of thirty-five horse power to impel the same boat at the rate of ten miles an hour. The action of what is called a twenty-five horse power engine is just equal to the impulse given by 1,000 cubic feet of water falling through the height of ten feet.

SUPPOSED WEIGHT OF A FIRST-RATE MAN-OF-WAR.

A MAN in health consumes, in the space of 24 hours, about eight pounds of victuals and drink, consequently 8,000 pounds of provisions are required daily in such a ship. Now let us suppose her to be fitted out for three months only, and we shall find that she must be laden with 720,000 pounds of provisions. A large forty-two pounder weighs about 6,100 pounds if made of brass, and about 5,500 pounds if of iron; and generally there are 28 or 30 of these on board a ship of 100 guns, the weight of which, exclusive of that of their carriages, amounts

to 183,000 pounds. On the second deck 30 twenty-four pounders, each of which weighs about 5,100 pounds, and therefore altogether, 153,000 pounds, and the weight of the 26 or 28 twelve-pounders, on the lower deck, amounts to about 76,400 pounds, and that of the 14 six-pounders on the upper deck to about 26,000 pounds, and besides that, on the round tops, there are even three-pounders, and swivels. Now, if to this we add, that the complete charge of a forty-two pounder weighs about 64 pounds, and that at least upwards of 100 charges are required for each gun, we shall find this to amount nearly to the same weight as the guns themselves. In addition to this, we must reflect, that every ship must have, by way of providing against exigencies, at least another set of sails, cables, cordage, and tacklings, which altogether amount to a considerable weight. The stores, likewise, consisting of planks, pitch, and tow; the chests belonging to the officers and sailors; the surgeon's stores, and various other articles requisite on a long voyage; as also the small arms, bayonets, swords, and pistols, are no inconsiderable load; to which we must finally add, the weight of the crew, which is not very trifling; so that one of these large ships carries at least 2,162 tons burden, or 4,324,000 pounds, and at the same time is steered and governed with as much ease as the smallest boat. —*Contemplative Philosopher.*

EXPENSE OF BUILDING A FIRST-RATE MAN-OF-WAR.

A FIRST-RATE man-of-war has its gun-deck from 159 to 174 feet in length, and from 44 to 50 feet broad; contains from 1,313 to 1,882 tons; has from 700 to 800 men; and carries from 96 to 110 guns. This ship requires about 60,000 cubic feet of timber, and uses 180,000 pounds of rough hemp in the cordage and sails for it. The ground on which the tim-

ber for a 74 gun-ship would require to grow, would be 14 acres. It requires 3,000 loads of timber, each load containing 51 cubic feet; 1,500 well-grown trees of two loads each, will cover 14 acres at 20 feet asunder; 3,000 loads of rough oak, at 2s. per foot, or £5. per load will cost £15,000.—MILLARD'S *Cyclopedia.*

LAND-SAILING CARRIAGES.

THE carriage in which Mr. Slater a few years since went over land with despatches to the East Indies, and traversed the Arabian deserts, went at the astonishing rate of twenty miles an hour, so that it was supposed from Alexandria it would reach Bassora in a few days. It was constructed with broad wheels, and impelled by sails in the same manner as a ship, and so contrived, that it went as close to the wind as any cutter; and carried swivels to guard against the wandering Arabs. When Mr. Slater first set off in this machine, the wind was fair and moderate, and he was accompanied many miles by a considerable number of persons, mounted on camels, and fleet horses, whom curiosity attracted; but, in some time, the wind freshening, the motion became so rapid, that they were obliged to give up the pursuit. At Alexandria several ingenious mechanics have improved upon this curious mode of progression, and it is said that machines are now contriving, which will travel even with more expedition, and yet with perfect security.

This curious machine is thus described by the celebrated Bishop Wilkins.

The body of it being somewhat like a boat, moving upon four wheels, of an equal bigness, with two sails like those of a ship, there being some contrivance to turn and steer it by moving a rudder, which is placed behind the two hindmost wheels; and for the stop-

ping of it, this must be done, either by letting down the sail, or turning it from the wind.

Similar inventions are frequently to be seen in Holland. Little vessels for one or two persons go upon the ice, having sledges instead of wheels, and are driven with a sail. The bodies of them like little boats, are so constructed, that if the ice should break, they may yet safely carry a man upon the water, where the sail would be still useful for the motion of the boat.—BISHOP WILKINS'S *Mathematical Magic.*

PARROTS—CURIOUS INSTANCES OF THEIR SAGACITY.

THE common ash-coloured parrot is the well known species which is now most commonly brought into Europe. It is superior to most others, both in the facility, and the eagerness with which it imitates the human voice. It listens with attention, and strives to repeat. It dwells constantly on some syllables which it has heard, and seeks to surpass every voice by the loudness of its own.

A parrot which Colonel O'Kelly bought for an hundred guineas at Bristol, not only repeated a great number of sentences, but answered many questions; it was also able to whistle many tunes. It beat time with all the appearance of science; and so accurate was its judgment, that if, by chance, it mistook a note it would revert to the bar where the mistake was made, correct itself, and, still beating regular time, go through the whole with wonderful exactness. Its death was thus announced in the General Evening Post for the 9th of October 1802:—"A few days ago, died in Half Moon Street, Piccadilly, the celebrated parrot of Colonel O'Kelly. This singular bird sang a number of songs in perfect time and tune. She could express her wants articulately, and give

her orders in a manner approaching nearly to rationality. Her age was not known; it was, however, more than thirty years; for previously to that period, Colonel O'Kelly bought her at Bristol for a hundred guineas. The Colonel was repeatedly offered five hundred guineas a year for the bird, by persons who wished to make a public exhibition of her; but this, out of tenderness to the favourite, he constantly refused. The bird was dissected by Dr. Kenneds and Mr. Brookes; and the muscles of the larynx, which regulate the voice, were found, from the effect of practice, to be uncommonly strong."

Dr. Goldsmith relates that a parrot, belonging to King Henry the Seventh, having been kept in a room next the Thames, in his palace at Westminster, had learned to repeat many sentences from the boatmen and passengers. One day, sporting on its perch, it unluckily fell into the water. The bird had no sooner discovered its situation than it called out aloud, "A boat! twenty pounds for a boat!" A waterman, happening to be near the place where the parrot was floating, immediately took it up, and restored it to the King, demanding as the bird was a favourite, that he should be paid the reward it had called out. This was refused; but it was agreed that, as the parrot had offered a reward, the man should again refer to its determination for the sum he was to receive. "Give the knave a groat," the bird screamed aloud the instant the reference was made.

Mr. Locke, in his Essay on the Human Understanding, relates the following anecdote concerning a parrot. During the government of Prince Maurice in Brazil, he had heard of an old parrot that was much celebrated for answering, like a rational creature, many of the common questions that were put to it. The curiosity of the Prince was roused, and he directed it to be sent for. When it was introduced into the room where the Prince was sitting in company with several Dutchmen, it immediately ex-

claimed in the Brazilian language, "What a company of white men are here!" They asked, "Who is that man?" (pointing to the Prince), the parrot answered, "Some general or other." When the attendants carried it up to him, he asked, through the medium of an interpreter, "From what place do you come?" The parrot answered, "From Marignan." The Prince asked, "To whom do you belong?" It answered, "To a Portuguese." He asked again, "What do you do there?" It answered, "I look after chickens?" The parrot in continuation said, "Yes, I; and I know well enough how to do it;" clucking at the same time, in imitation of the noise made by the hen to call together her young ones.

Madame Nadault, sister to Buffon, had a parrot, which often spoke to his paw, and answered by holding it up. He loved the voice of children, yet hated themselves, pursued and bit them till he drew blood. He had also his objects of attachments; and though his choice was not very nice, it was constant. He was very fond of a cook-maid, followed and sought her, and seldom missed finding her. If she had been some time out of his sight, the bird climbed with his bill and claws to her shoulders, lavished his caresses, and would on no account quit her; his fondness had all the marks of close and warm friendship. The girl happened to have a very sore finger, which was tedious in healing, and so painful as to make her scream; while she uttered her moans, the parrot never left her chamber. The first thing he did every day, was to pay her a visit; and this tender condolence continued the whole time of the cure, when he returned to his calm settled attachment. Yet this strong predilection seems to have been more to the office of the girl in the kitchen, than to her person; for, when another cook-maid succeeded her, the parrot showed the same fondness the very first day.

The power of imitating exactly articulate discourse, implies in the parrot a very peculiar and perfect

structure of organ; and the accuracy of its memory, (though independent of understanding), manifests a closeness of attention, and a strength of mechanical recollection, that no other bird possesses in so high a degree. Accordingly all naturalists have remarked the singular form of its bill, of its tongue, and its head. Its bill, round on the outside and hollow within, has, in some degree the capacity of a mouth, and allows the tongue to play freely; and the sound, striking against the circular border of the lower mandible, is there modified as on a row of teeth, while the concavity of the upper mandible reflects it like a palate; hence the animal does not utter a whistling sound, but a full articulation. The tongue, which modulates all sounds, is proportionally larger than in man; and would be more voluble, were it not harder than flesh, and invested with a strong horny membrane. From the peculiar structure of the upper mandible of its bill, the parrot has a power, which no other birds have, of chewing its food. It seizes its food sideways, and gnaws it deliberately. The lower mandible has very little motion, but that from right to left is most perceptible; and this is often performed when the bird is not eating, whence some persons have supposed it to ruminate. In such cases, however, the bird may be only whetting the edge of this mandible with which it cuts and bites its aliment.—*Shaw's Nature Displayed.*

THE LIFE-BOAT.

MARINERS are indebted for this admirable invention to Mr. Greathead, an eminent boat-builder of South Shields. The boat measures 30 feet by 10, and resembles in form a common Greenland boat, but more flat in the bottom. The quantity of cork employed in the construction is about seven hundred weight, with which the boat is lined on the inside as well as

outside of the gunwales, two feet in breadth; the seats being also filled with the same material. It is rowed by ten men, doubly banked, and steered by one at each end with oars, being alike in its form at both ends, and contrived so as not to sink in the sand. This boat draws very little water, and can carry twenty persons even when full of water. Being waterproof, and rendered buoyant by cork, it always keeps afloat, preserving its equilibrium without any danger of oversetting. It is able to contend against the most tremendous sea, having never failed, in a single instance, of conveying a ship's crew to shore in safety. The vessel, when complete and copper nailed, costs about £150. This boat has exceeded every expectation. During the last eighteen years, not fewer than between 200 and 300 lives have been saved at the entrance of the Tyne alone, which otherwise must have been lost; and in no instance has it failed. The first trial of this boat was in the year 1790; and in 1802, the Society of Arts rewarded the inventor with their gold medal, and 50 guineas for the invention.—MILLARD'S *Cyclopedia.*

DIVING-BELL.

THE Diving-Bell is a machine so contrived, that the diver is safely conveyed to any reasonable depth; and may stay more or less under the water, as the bell is greater or less. It is most conveniently made in the form of a truncated cone, the smallest base being closed, and the larger open. It is to be poised with lead and so suspended, that it may sink full of air, with its open basis downward, and as near as may be in a situation parallel to the horizon, so as to close with the surface of the water all at once.

Under this covercle the diver sitting sinks down with the included air to the depth desired; and if the cavity of the vessel can contain a tun of water, a sin-

gle man may remain a full hour without much inconvenience, and at five or six fathoms deep But the lower he goes, still the more the inclined air contracts itself, according to the weight of the water that compressed it; so that at 33 feet deep the bell becomes half full of water, the pressure of the incumbent water being then equal to that of the atmosphere; and at all other depths, the space occupied by the compressed air in the upper part of its capacity, is to the space filled with water, as 33 feet to the depth of the surface of the water in the bell below the common surface of it. And this condensed air, being taken in with the breath, soon insinuates itself into all the cavities of the body; and has no ill effect, provided the bell be permitted to descend so slowly as to allow time for that purpose.

When the English, in 1588, dispersed the Spanish fleet, called the Invincible Armada, part of the ships went to the bottom, near the Isle of Mull, on the western coast of Scotland; and some of these, according to the account of the Spanish prisoners, contained great riches. This information excited, from time to time, the avarice of speculators; and gave rise to several attempts to procure part of the lost treasure. In the year 1665, a person was so fortunate as to bring up some cannon, which, however, were not sufficient to defray the expenses. Of those attempts, and the kind of diving-bell used in them, the reader will find an account in a work printed at Rotterdam in 1669, and entitled "*G. Sinclari Ars nova et magnæ gravitatis et levitatis.*" In the year 1680, William Phipps, a native of America, formed a project for searching and unloading a rich Spanish ship, sunk on the coast of Hispaniola; and presented his plan in such a plausible manner, that king Charles II. gave him a ship, and furnished him with every thing necessary for the undertaking. He set sail in 1683; but being unsuccessful, returned again in great poverty, though with a firm conviction of the

possibility of this scheme. By a subscription promoted chiefly by the Duke of Albemarle, the son of the celebrated Monk, Phipps was enabled, in 1687, to try his fortune once more, having previously engaged to divide the profit according to the 20 shares of which the subscription consisted. At first, all his labour proved fruitless; but at last, when his patience was almost entirely exhausted, he was so lucky as to bring up, from the depth of six or seven fathoms, so much treasure, that he returned to England with the value of £200,000 sterling. Of this sum he himself got about £16,000, others say £20,000, and the duke £90,000. After he came back, some persons endeavoured to persuade the king to seize both the ship and the cargo, under a pretence that Phipps, when he solicited for his majesty's permission, had not given accurate information respecting the business. But the king answered, with much greatness of mind, that he knew Phipps to be an honest man, and that he and his friends should share the whole among them, had he returned with double the value. His majesty even conferred upon him the honour of knighthood, to shew how much he was satisfied with his conduct. We know not the construction of Phipps's apparatus; but of the old figures of a diving-machine, that which approaches nearest to the diving-bell, is in a book on fortification, by Lorine, who describes a square box, bound round with iron, which is furnished with windows, and has a stool affixed to it for the diver. This ingenious contrivance appears, however, to be older than that Italian; at least, he does not pretend to be the inventor of it.

After various attempts at improvement in this machine, by different people, succeeded Dr. Halley, whose bell may be sufficiently understood from the following account:—It was made of wood, containing about sixty cubic feet in its concavity, and was in the form of a truncated cone, whose diameter at

the top was three feet, and at the bottom five. It was so loaded with lead, that it could go down in a perpendicular direction, and no other. In the top was a window to let in light, and likewise a cock to let out the hot air that had been breathed; and below, about a yard under the bell, was a stage, suspended by three ropes, each of which was charged with about one hundred weight to keep it steady. To supply air, the bell had a couple of barrels so cased with lead, as to sink when empty, each having a bung-hole in its lowest part to let in the water as the air in them condensed on their descent, and to let it out again when they were drawn up full from below. To a hole in the uppermost part of these was fixed a leathern trunk or hose, long enough to fall below the bunghole, and kept down by a weight, in such a way that the air in the upper part of the barrels could not escape, unless the lower ends of these hose were lifted up. These air barrels were made to rise and fall like two buckets in a well; by means of these barrels fresh air was continually supplied from above, and it was done with so much ease, that two men, with less than half their strength, could perform all the labour required. By an additional contrivance, it was found practicable for a diver to go out of the engine, to some distance from it, the air being conveyed to him in a continual stream by small flexible pipes.

Great improvements have been made in the diving-bell by Mr. Walker, Mr. Spalding, and several other mechanical gentlemen; yet it must be acknowledged, that with all these improvements, this very curious machine appears to have been outdone, in some respects, by an invention of the famous Cornelius Drebell, if all be true that we are told about it. He contrived not only a vessel to be rowed under water, but also a liquid that would supply the want of fresh air. The vessel was made for King James I., and carried twelve rowers, besides the passengers. It

was tried in the river Thames, and one of the persons who was in the vessel when the experiment was made, told it to another who gave an account of it to the ingenious Mr. Boyle. As to the liquor, Mr. Boyle assures us, he discovered by a physician, who married Drebell's daughter, that it was used as occasion required, when the air in the submarine boat was clogged by the breath of the company, and rendered unfit for respiration; at which time, by unstopping a vessel full of this liquor, he could presently restore to the troubled air such a quantity of vital parts, as made it useful again for a considerable time. The secret of this liquor Drebell would never disclose to more than one person, who communicated the preparation to Mr. Boyle: but that gentleman seems to doubt whether the virtues of the liquor were so effectual as reported.—*Pantologia*, and SMITH'S *Wonders*.

THE HUMMING BIRD.

THERE is in most parts of America a bird, called by the English the humming bird, by the Spaniards *tominicius*. It is of a most excellent shining green colour, and very resplendent, the colour doth something resemble some of our English drake's heads. It doth inhabit some of the colder parts of America, as well as the hotter. It is the least of all birds that I have seen there or in England, its leg and foot together is but half an inch, the other parts answerable; the trunk of its body not an inch. I did weigh one in those parts as soon as ever it was killed, whose weight was the tenth part of an ounce *avoirdupois*, which I take to be about the weight of a coined sixpence. And I have weighed here in England a titmouse, (which I take to be the least bird here), and it weighed above two shillings, and some half-a-crown. I saw one of their nests made of cotton wool, in form

and bigness of the thumb of a man's glove, with the taper end set downwards, wherein were two eggs of the bigness of a pea, of oval form. They feed by thrusting their bill and tongue into the blossoms of trees, and so suck the sweet juice and honey from them; and when it sucks it sits not, but bears up its body with a hovering motion of its wings. But for the relation that it is a curious singing bird, I think it untrue. An Indian soggamore is not in his full pomp and bravery without one of these birds in his ear for a pendant. It is called the *hum* bird or *humming* bird, because some say it makes a noise like a spinning-wheel when it flies. But I have been many times very near them, both when they hovered, and when they did fly, and I never heard any noise; besides, their body and wings are too small to strike air enough to make any noise. But of this I shall not be positive, because some authors are opposite to me. It is a solitary bird. I never saw but two at a time together, viz. the male and female; they being easily known when together, the male being somewhat bigger than the female.—*Phil. Trans. Vol. II.*

MUSIC PRODUCED FROM IRON.

THERE are few but have heard of that charming melody, called the *Harmonious Blacksmith.* The origin of it is thus told:—When Handel, the composer, was on a visit to the Duke of Chandos, at Edgeware, he was one day overtaken by a heavy shower of rain. This great genius took shelter under a blacksmith's shop by the road side, (this shed, still identified by the residents in the neighbourhood, is, from its ruinous state likely to disappear; it is now (1838) and has been for some time past in the possession of a butcher; it is in fact his abattoir)—where his laborious occupant was beating the iron on the anvil, and singing at his work. The varying

sounds of the falling hammer on the metal, mingled with the rude tones of the man's voice, entered into the very soul of the attentive listener. He carried home with him the fitting character, the inspiration of an idea admirable alike for the beauty and simplicity of its development, and gave us for a rich legacy, the notation of the few touching bars which we have received under the name of *The Harmonious Blacksmith.*

WINDS.

WIND is a volume or mass of air in motion; it blows from any point in the horizon to its opposite. When the wind blows strong or flies swift, it is called a high wind; and moves above 50 miles an hour. In one of Dr. Lind's experiments he found that the velocity of the wind was 93 miles an hour, a swiftness of motion, which since M. Garnerin's aërial voyage to Colchester, must be considered within the limits of probability.

Winds or currents of air are produced by the rarefaction or condensation of the atmosphere by heat, cold, lightning, &c. The sun, the source of light and heat, is the chief agent or power that regulates the wind, and were the surface of the earth uniform, that is, equally smooth, and also equally under the influence of the sun's beams, the wind would always blow from the east. But as the influence of the sun is permanent only near the equatorial parts, and there only on the oceans, the other parts of the earth must have the winds irregular, consequently an alteration of heat or cold happening in any part of the atmosphere, the air in that part will be either rarefied* or

* Heat always rarefies the incumbent air, and consequently renders it lighter: the cold or unrarefied always rushes in to make up the deficiency, and this produces the

condensed, and the adjacent parts will thereby be put in motion, through the endeavour which the air, by its elacticity, always makes to restore itself to its former state, or come to an equilibrium.

The winds may be divided into three sorts, 1. trade winds, 2. monsoons, and 3. variable winds.

1. *Trade Winds* are so named from their convenience in trade. In the Atlantic and Pacific Oceans between 30° N. and 30° S. the wind blows constantly from the east, and would uniformly do the same across Africa and America within their limits, were it not interrupted by the high mountains that lie in the direction of N. and S. particularly the lofty Andes in America, and the mountains of Atlas, the Moon, and of the Lions in Africa.

The cause of the trade winds is the diurnal motion of the earth, which turning from west to east, the part immediately under the sun being heated, the air is rarefied and rendered lighter; hence to restore the equilibrium of this elastic fluid, the air rushes in from the north and south, and consequently makes a current in a direction contrary to the earth's motion, that is from east to west; apparently following the tract of the sun, whose course appears to be in the same direction.

The trade winds near these northern limits, blow between the north and east, and near the southern limits, between the south and east.

2. *The Monsoons*, (this word Mr. Marsden has supposed to be a corruption of the word Monseen, which both in Arabic and Malay signifies a year,) are periodical winds, which blow six months one way and six months the contrary way; they prevail

currents which are observed in close warm rooms, and near fires or doors. Cold, on the contrary, always condenses the atmosphere and renders it weightier, hence the reason why the northern regions are not wholly uninhabitable during the winter season: the increased pressure of the atmosphere compensates for the absence of genial heat.

chiefly in the Red Sea, the Arabian Sea, and through the northern parts of the Indian Ocean, and in the Chinese Sea.

The monsoons are neither the same with respect to the points that wind blows on, nor are the times of their changing the same. It is likewise necessary to observe that the changing is not the work of a moment, but that it is sometimes several weeks before a complete change is brought about, during which there is sometimes calms, variable winds, and sometimes violent storms, of the nature of the hurricanes in the West Indies; these tempests by the sailors are called the breaking up of the monsoons. On the W. side of the Arabian Sea they set in about September, blowing from the N. E. points to the S. W. till April; when they change and blow the contrary way the remainder of the year. To the eastward of Sumatra and Malacca, on the N. of the equator, and along the coasts of Cambodia and China quite through the Philippines as far as Japan, the monsoons blow northerly and southerly; the northern setting in about October or November, and the southern about May. These winds are not quite so certain as those in the Arabian Sea.

Between Sumatra and Java to the west, and New Guinea to the east, the same northerly and southerly winds are observed; but the first half of the year the monsoons incline to the N. W. and the other half of the year to the S. E. These winds begin a month or six weeks after those in the Chinese Sea set in, and are quite as variable.

3. *Variable Winds*, are those that keep no fixed period, such as we experience daily, the wind sometimes changing to all the points of the compass in a few hours. These winds chiefly prevail towards the northern and southern regions of the earth; beyond thirty degrees of north or south latitude. The principal points from which the winds blow in England are the north-east and south-west: the former (chiefly

in January, March, April, and May) during 5 months of the year, the latter during 6 months, and the remaining month from every point of the compass.

THE VOICE.

In those countries where man, like a plant, may be said to grow and flourish, the voice expands, ripens and comes to perfection: but in the northern and colder regions, where the mouth is more constantly closed, the voice is restricted and escapes with difficulty. Greece and Italy, those far famed countries, which have been the admiration of the world for their mild and beautiful climate, have been ever famous for the vocal art, under a sky so serene, the voice partakes of that clear and open tone that at once creates a language pure, free and harmonious. This euphony of speech, or *aria parlante*, may be regarded as a natural faculty, and it is but a slight step in those countries to move into all the beauties of song. In a climate like our own, where nature has been less generous, it is a rare instance to meet with any voices that are truly excellent. Many of our words have had their origin in several climes, and partake so much of the nasal and guttural tones as to destroy every vestige of melody. The first and most important operation is to open the mouth so completely that the voice may meet with no obstruction in its course. In harsh and disagreeable voices the organs are too much contracted, so that the voice has not a free and easy passage.

VOICE AND SOUND.

It is a curious fact, that musical sounds fly farther, and are heard at a greater distance, than those which are more loud and noisy. If we go on the outside of

a town during a fair, at the distance of a mile, we hear the musical instruments, but the din of the multitude, which is so overpowering in the place, can scarcely be heard, the noise dying on the spot. To those who are conversant with the power of musical instruments, the following observation will be understood. The violins made at Cremona about the year 1660 are superior in tone to any of a later date, age seeming to dispossess them of their noisy qualities, and leaving nothing but the pure tone. If a modern violin is played by the side of one of those instruments, it will appear much the loudest of the two, but on receding a hundred paces, when compared with the *Amiti*, it will scarcely be heard. When *Bartholemo* led the opera, the connoisseurs would go into the gallery to hear the effect of the Cremona violin, which at this distance predominated greatly over all the other instruments, though in the orchestra it was not perceptibly louder than any of the rest. The voice of man is endowed with the purity of tone, in a higher degree than any of the vocal animals, by which, in a state of nature, it enables him to communicate with his fellows at a distance very remote. Providence has bestowed upon children a power of voice, in proportion to their size, ten times greater than the adult. In a state of nature this serves them as a defence and protection, for it is well known that infants have, by their cries alarmed and kept off the attacks of the most furious animals.

CURIOUS TREES.

THE uses and virtues of the Bread-fruit tree are known to be exceedingly important, and yet it grows in Ceylon, and is little respected. In Guam, it grows larger than our apple-trees; when ripe, it is soft and yellow, and its taste is sweet. When full grown, the Guamans bake it, it having neither seed nor stone,

but is a pure substance, like bread, and lasts in season, eight months of the year.

In some parts of Norway, where vegetation is confined principally to moss and lichens, it has been discovered that even those vegetables may with little trouble, be converted into bread, more palatable and nourishing than bread of bark, to which the Norwegians have so long been accustomed.

But the greatest of all vegetable phenomena, though not so useful to mankind as the bread-fruit, appears to be the *Palo de Vaca*. This plant produces a glutinous liquid, like an animal. It frequently grows upon the sides of a rock, and has dry curiaceous leaves. For several months of the year, its foliage is not moistened by a single shower of rain, and its branches appear entirely dried up; but upon piercing the trunk, particularly at the rising of the sun, there flows a sweet and nourishing yellow juice, having a balsamic perfume, with many of the qualities of milk. In the morning, the natives of the country in which this vegetable fountain grows, visit it with bowls, in which they carry home its milk for their children. So that this tree, says Baron Humboldt, seems to present the picture of a shepherd, distributing the milk of his flock. The Araguans call it the cow; the Caucaguans the milk-tree. It grows too in the country from Barbuta to the Lake Maracaibo.

In the interior of Africa is a tree (Shea), which furnishes excellent butter. It resembles an American oak, and its fruit is not unlike the Spanish olive. It grows abundantly in Ashantee, and in the woods near Kabba. The vegetable butter, which its kernel affords, is white, more firm, and in Parke's opinion, far better than that produced from cows. It has also the advantage of keeping all the year without salt, even in that intensely hot country. The cream-fruit of Sierra Leone affords a similar saccharine

fluid. Its flower resembles that of the vahea; its fruit that of the vocanga, of which the Madagascarenes make birdlime; and that of urceacla, which produces the caoutchouc of Sumatra. These trees lessen the consequence of the cow very materially in these longitudes; but in some countries far more civilized, the natives seem to disdain to avail themselves even of that animal itself.

In some regions of America, Africa, and Asia, a liquid is exuded from the palm, which, by an easy process, is converted into wine. This species of palm is regularly tapped. In Congo, it yields plentifully at night, but not much in the day.

Between Table Bay and Bay False, near the Cape of Good Hope, there grows also, amid white sand, a shrub, the berries of which make excellent candles. This plant is well known in the Azores and America, where it is called the Candleberry-myrtle. Vegetable tallow grows also at Siac and Sumatra; while the bark of the quillai tree of China has many of the properties of soap.

In Chili there is a shrub called Thurania, which affords incense equal to that of Arabia. It exudes in the form of globules of tears, through pores of the bark. These globules are white and transparent, having a bitter taste, but an aromatic perfume. In that fine country, too, grows a species of wild basil, sixty miles from the sea, which, in a soil having no appearance of salt, is covered in the morning, from spring to winter, with saline globes, which the Chilians use as salt. In Mexico there is a tree, the flower of which, before it has expanded, resembles the closed hand of a monkey; when unfolded, the open hand. From this circumstance is derived the name of *Chiranthodeadron*. Not long since there existed only one specimen of this tree in the known world. It grows and has flourished for many ages in *Toluca*, a city of Mexico, where it is esteemed sacred, and whither persons travel from great dis-

tances in order to procure its flowers. This was the only tree of its genus, previous to the year 1787, that was known to be in existence. But some botanists having visited Toluca in that year, they took slips, and planted them in the royal gardens in Mexico, where some of them took root, and had grown, in 1804, to the height of forty-five feet. The Talipot of Ceylon grows to the height of one hundred feet, and its leaf is so large that it will cover from sixteen to twenty men like an umbrella. But the largest leaved plant in the world is the Troolie of Surinam. It extends on the ground, and has frequently been known to attain a width of three feet, and a length of thirty. The natives cover their houses with it, and it is very durable.

Ives says, in his Voyage to India, that he saw a Banyan, near Trevan de Parum, able to shelter ten thousand men; and Dr. Fryer alludes to some so large as to shade thirty thousand horse and men singly. On an island in the Nerbudda, a few miles from Baroach, grows one more remarkable than any other in India. Travellers call it the "Wonder of the vegetable world," being two thousand feet in circumference. Armies may encamp under its branches. The Hindoos esteem it the symbol of a prolific deity; and British officers frequently, in their excursions, live many weeks together under its canopy. The Capot is the only tree that can be compared to the Banyan; and Bosman relates, that he saw one on the Gold Coast of Guinea which was so large that it would shade twenty thousand men at least

We may here say a few words relative to the ages of trees. Franklin mentions two Cypresses which the Persians believed to be six hundred years old. Chardin mentions a Plane tree of a thousand years. Forbes says, that he smoked his nookha under the very banyan beneath which part of Alexander's cavalry took shelter; and the age of the oaks of Lebanon is said to be at least two thousand years.—*Buckle*

on the Beauties, Harmonies, and Sublimities of Nature.

CURIOUS ECHO.

An echo of a very peculiar character has been described by Sir John Herschell as produced by the suspension bridge across the *Menai Strait* in Wales. The sound of a blow of a hammer on one of the main piers is returned in succession from each of the cross beams which support the roadway, and from the opposite pier at a distance of 576 feet; and in addition to this the sound is many times repeated between the water and the roadway, at the rate of 28 times in five seconds.

COOKING WITHOUT FIRE.

An experiment of cooking rump steaks without fire is satisfactorily conducted almost daily at the Gallery of Practical Science, by Mr. Mangham, the chemical lecturer. The process, which is very simple, is as follows:—a square tin apparatus was constructed, with a thin drawer in the centre, above and below which are spaces into which you put the *fuel*. This *fuel* is simply lime dipped into water, and instantly deposited in the places made for its reception. By the time the apparatus is closed, the slaking of the lime had commenced, and the heat evolved by this process, was found sufficient to cook the steak in about fifteen minutes. When taken out, the beef had more the appearance of being boiled than roasted, but it had in flavour all the richness of a broiled rump steak. It was cut into small pieces, and all the company partook of it, and seemed highly pleased with the beef and the experiment.

THE LION.

Of all the animals of Barbary, the Lion, usually called the king of beasts, seems to merit our first attention. This fierce animal, which rules with such a tyrannical empire over the inhabitants of the woods and deserts, has a head very large, and not at all proportioned to his body. He has a thick flattish nose, a very wide mouth, red fiery eyes, hollow, and looking somewhat awry. His neck is adorned with a fine shagged mane, but the lioness wants this ornament. He has a long tail, very strong legs, and each of his fore feet has five distinct claws, except the hinder, which has but four, all crooked, sharp, and exceeding hard. The hair of some lions is curled, of others lank and thin, and generally of a dun colour; but Mr. Park informs us that he once saw a very large red lion in the course of his travels through the interior of Africa. The roaring of the lion is frightful and every beast dreads his approach. He is of a very savage nature, preying upon other animals, chiefly the wild boar, which yet (as Dr. Shaw informs us) has sometimes been known to defend itself with so much bravery, that the victory has inclined to neither side, the carcases of them both having been found lying dead together, covered with gore and mangled to pieces.

Some have reported that the lion is afraid of women, and that, upon taking up a stick and calling him names, he will immediately lose his fierceness, and fly from the flocks they are attending. Something of this kind, says a learned traveller, perhaps may have happened when they have been well satiated with food, at which time the Arabs pretend the lions have so little courage, that they can seize upon their prey, and rescue it out of their jaws. But these instances are very rare, it oftener falling out, that lions devour women as well as men, for want of other creatures. Fire is what they are most afraid of; and yet notwith-

standing all the precaution the Arabs take in this respect, together with the barking of their dogs, and the noise themselves make all night long, it frequently happens, that a lion will leap into the midst of an enclosure, and bring out along with him a sheep or a goat. If these ravages are repeated, the Arabs take notice where the lion enters, and there dig a pit, covering it slightly with reeds, or small branches of trees, into which he falls and is taken.

The hunting of the lion, according to Dr. Shaw, is in some respects like the method of taking elephants heretofore described. On this occasion a whole district is summoned to appear, who forming themselves into a circle, enclose a space three, four or five miles in compass, according to the number of people and quality of the ground that is pitched upon to be the scene of action. The footmen advance first, rushing into the thickets with their dogs and spears to put up the game; whilst the horsemen, keeping a little behind, are always ready to charge, as soon as the wild beast makes a sally. Thus they proceed, still contracting their circle, till they all at last either close in together, or meet with something to divert them. This sort of pastime is sometimes very agreeable; for different kinds of animals being by this means driven together, they seldom fail of having chases after hares, jackalls, hyenas, and other creatures, as well as the lion. But this sport is frequently attended with fatal accidents; for it is a common observation, that when the lion perceives himself in danger, nay sometimes the very moment he is roused, he will seize directly upon the person that is nearest to him, and, rather than quit his hold, suffer himself to be cut to pieces.

Lions are very common at the Cape, where they are extremely large, and every limb is expressive of the greatest strength; the firmness of their tread, their dreadful paws, and sparkling eyes, command attention, and show their strength superior to that of other animals. Some authors have affirmed that the bones

of the lion are not so hard as they have been represented by the ancients; but Mr. Kolben observes that the hollow which runs through the shin-bone of a lion, is as small as that which runs through a tobacco-pipe; and when it is broken to pieces, and the oiliness exhausted by the heat of the sun, these pieces appear as hard, smooth, and solid as flints; and serve altogether as well to strike fire with. Indeed, a considerable part of this animal's strength lies in the hardness of his bones; for when he comes upon his prey, he knocks it down dead, and never bites till he has given the mortal blow, which he generally accompanies with a terrible roar. When enraged, or pinched with hunger, he erects and shakes his mane, lashing his back and sides with his tail. When thus employed, it is certain death to come in his way; and as he generally lurks for his prey behind bushes, travellers are sometimes devoured by him; but if he neither shakes his mane, nor makes any great motion with his tail, a traveller may be fully assured of passing by him in safety. A horse no sooner discovers a lion than he runs full speed; and, if he has a rider, throws him if possible, in order to run the faster. When a traveller on horseback discovers a lion, the best method of preservation is instantly to dismount, and abandon his horse, which the lion will pursue, without taking notice of him. The flesh of the lion is said to taste something like venison.—SMITH'S *Wonders.*

MINIATURE CANNON.

WE have seen a miniature cannon, which is a specimen of neat and ingenious handicraft, it is well worth the attention of the public. It is complete in all respects, having a bore and touchhole; the gun is made of steel, the carriage of gold, and the wheels of silver; and the whole weighs only the twenty-ninth part of a grain; The workmanship is very beautiful, but

cannot be distinguished except through a powerful magnifying-glass; the size of this warlike engine being only about that of a common pin's head.—*Plymouth Journal, May* 28, 1828.

SENSITIVE HAIR.

In the hospital of the Royal Guards at Paris, was a private soldier who had received a violent kick on the back of his head from a horse. The excitement of the hair produced was extreme, and could only be kept under by almost continued bleedings, both local and general. Amongst a series of phenomena produced by the state of preternatural excitation, the sensibility acquired by the hairs of the head was not the least remarkable. The slightest touch was felt instantly, and cutting them gave exquisite pain, so that the patient would seldom allow any one to come near his head. Baron Larrey, to put him to the test, gave a hint to an assistant, who was standing behind the patient, to clip off some hair without his perceiving it. This was done with great dexterity, but the soldier broke out into a volley of oaths, succeeded by complaints, and it was some time before he could be appeased.

MUSCULAR STRENGTH.

The muscular power of the human body is wonderful. A Turkish porter will run quickly carrying a weight of 600lbs; and a man of Crotona, is said to have lifted an ox weighing upwards of 1000 pounds! Haller mentions that he saw a man, whose finger being caught in a chain, at the bottom of a mine, by keeping it forcibly bent, supported by that means the weight of his whole body, 150lbs, till he was drawn up to the surface, a height of 600 feet! The

most prodigious power of the muscles is exhibited by fish. A whale moves with a velocity through the dense medium of water, that would carry him, if continued at the same rate, round the world in little more than a fortnight; and a sword fish has been known to strike his weapon quite through the plank of a ship!

A PRODIGIOUS WORK OF ART.

Extracted from Col. Welsh's Military Reminiscences of the East Indies, 1830.

ESTIMATED as a military post only, Nungydeo must ever rank high, from its being almost inaccessible; though all wonder at the preceding sight was speedily lost in our surprise, when, after ascending several neat staircases, we suddenly came upon a large stone building, above which we then first discovered a finely-formed image, carved out of one solid stone, about seventy feet high, and representing a young man with wreaths of laurel winding from his ankles to his shoulders, every leaf of which was so exquisitely laboured, as to bear the closest examination. We were able to contrast the size of this extraordinary colossus with men, monkeys, and vultures, two of the latter being perched upon his head, and the upper part being seven times the height of a middle-sized man who stood on the top of the building, with the legs and thighs of the statue below. That it was cut out of the solid rock cannot admit of a doubt; for no power on earth could have moved so massive a column to place it there on the top of a steep and slippery mountain—so steep, indeed, that we could not see the statue till we had ascended close to it. The legs and thighs are cut out in proportion to the rest, but are attached to a large fragment of the rock behind them,

artfully covered by the building of which it forms the back wall. I never in my life beheld so *great* a curiosity, every feature being most admirably finished: from the nose, inclining to the aquiline, and the under lip being very prominent and pouting, the profile shews it to the greatest advantage; and every part, from top to toe, is smooth and highly polished. I could hardly conceive how the hand of man, and that particularly of a race by no means either intelligent or educated, could have accomplished such a work of labour, and that too on the summit of a sterile rock. No person on the spot seemed either to know or care, when, or how, or by whom it was made; and though I have given it the usual appellation, the Brahmins call it Gometrauz and Gomethéz; and at a distance it appeared to be a stone pillar."

MOUNTAINS.

ALTHOUGH the earth, at the distance of Venus, or even at the smaller distance of the moon, would appear to be a perfect sphere, yet those bodies, when examined by a telescope, like the earth, exhibit great inequalities. Nevertheless, in such a mass as the earth, the mountains subtract less from its spherical figure, than the roughness on the rind of an orange subtracts from its sphericity. For although few mountains on the earth are four miles high, that elevation is but the two-thousandth part of the diameter; and the roughness on an orange being taken at the hundredth part of an inch, and the orange at three inches, those roughnesses are the three-hundredth part of the diameter, and, in proportion, six times greater with reference to the whole orange than the highest ridge of mountains is with reference to the earth. Such being the case, in regard to the ridges of the Himalayas in Thibet, and the Andes in South

America—the Alps, the Pyrenees, and the mountains of Scotland and Wales, sink into comparative insignificance.

The formation of mountains is a subject of difficulty. If the sea now flowed over the countries in which they are situated, they would constitute chains of islands in those seas; and from what we know of the depth of soundings round St. Helena, and other islands, we may consider them as mountains rising from the bed of the present ocean. The circumstance, that marine remains are found at great elevations in mountains, demonstrates, beyond the possibility of doubt, that the sea must, for many ages, have flowed at those elevations. But the apexes seem by their structure to have constituted parts of the original crust of the earth; unless indeed we are to suppose, that, in all instances, they are volcanic, and have been raised to their present heights by discharges of lava, and the scoriæ of internal local fires. This last seems to be a probable supposition, and, in that case, mountains must be regarded as the work of time. When raised, the returning action of the sea at their base may have undermined them, and we may probably ascribe to their overthrow, many surprising irregularities which appear on the surface of the earth.

With regard to the formation of minor hills and valleys, there seems no difficulty in ascribing them to the action of water. For it is a well known fact, that successive tides acting on the loose shingle, and sand on the shores, press the base of any elevation, in such a manner, as constantly to raise it higher and higher above the water; insomuch that the sea thus forms its own banks and boundaries. Almost every coast presents instances of these formations, but they are particularly conspicuous in the sand-hills on the coast of Flanders, where a line of sand-hills has palpably been forced up, and gradually accumulated by the sea, to the height of one, or two hundred feet above its level. Hence, it is not even necessary, that recur-

ring tides should actually overflow a country to form its hills and inequalities.

The most striking circumstance in the structure of rocks, is their disposition into strata, or layers placed one above the other, sometimes thick, and sometimes so thin as to present the appearance of what we call *slate*. This stratified structure deserves notice, not only in itself, but as affording an index to the early formation of the globe, since it can only be accounted for by the supposition of these rocks having been deposited from water. A great proportion of rocks, however, are unstratified, and their points are arranged sometimes in globular or columnar masses, but more frequently with perpendicular and cross rents, giving to the face of such rocks the appearance of stairs, whence mineralogists have applied to them the appellation of *trap*. These original formations are variously traversed by foreign substances, in the form of *veins*, which exhibit many curious phenomena, and in which the more valuable metallic and mineral substances are usually found incorporated.

Mr. Jameson observes, that the form of every mountain depends upon the species of rock of which it is composed, and is not affected by any other circumstance. Granite, when exposed, exhibits high and steep cliffs, sometimes vast mural precipices, and often shoots up into those lofty and precipitous summits which are denominated *peaks*. This steep and rugged character is less conspicuous in *gneiss*, and still less in *mica slate*, while in clay slate there appear only smooth and round-backed mountains, without cliffs or precipices. The earlier limestone presents rough cliffs, immense mural precipices, narrow and deep valleys. The later or floetz limestone, forms extensive tracts of flat country, intersected by narrow and deep valleys, sometimes by rocky cliffs and tremendous rents. Fragments of rock falling into these valleys, and being cemented by calc fintex, form large caves, which accompany this limestone in every part

of the globe. These caves abound in the mountains of Germany, particularly in the Julian Alps.—*Shaw's Nature Displayed.*

MOUNT ARARAT.

After we had writ our Journal fair, we three at table held a council, to consider what route to take the next day. We ran no hazard of being understood, because we talked French; and who is there upon Mount Ararat who can boast he understands French? Not even Noah himself, if he was to come thither again with his ark. We considered what the shepherds had said, which we looked upon as very material, especially that insuperable difficulty of the want of drink: for we reckoned it nothing to scale a mountain they represented so frightful. How vexatious is it, said we, to have come so far, to have gone up one quarter part of the mountain, to have found but three or four rare plants, and turn back again without going any farther! We advised with our guides: they, good men, unwilling to expose themselves to the danger of dying for thirst, and having no curiosity, at the expense of their legs, to measure the height of the mountain, were at first of the same sentiments with the shepherds, but afterwards concluded we might go to certain rocks, which stood out farther than the rest, and so return to rest at night in the same place we were now in. This expedient seemed very reasonable, and with this resolution we went to bed; but who could sleep under the inquietude in which we were? In the night, the love of plants overcame all other difficulties; and we three, by ourselves, concluded it was for our honour to ascend the mountain up to the snow, and venture being devoured by tigers. As soon as it was day, for fear we should die of thirst in our journey, we began to drink plentifully, and put ourselves to a sort of voluntary torture. The shepherds, who were become a little sociable, laughed heartily, and took us for persons who were endeavouring to destroy

ourselves. After this precaution it was necessary to dine, and it was no less punishment to eat without being hungry than it was to drink without thirst; but it was absolutely necessary, for there was no conveniency upon the way; and we were so far from being able to carry provisions with us, that it was with difficulty we could carry even our clothes through such bad ways. We ordered two of our guides to go with our horses, and wait for us at the abandoned Convent at the bottom of the abyss. We are forced to describe it thus, to distinguish it from that other abandoned Convent at Acourlou, which serves only for a retreat for passengers.

After this, we began to travel towards the first range of rocks, with one bottle of water, which, to ease ourselves, we carried by turns; but notwithstanding we had made pitchers of our bellies, in two hours they were quite dried up; and water shook in a bottle is a very disagreeable sort of drink. Our only hope, therefore, was to come at the snow, and eat some of it to quench our thirst. The pleasure of simpling is, that one may, under pretext of seeking plants, ramble as much as one pleases out of the direct road, and so tire ourselves less than if we were forced to ascend right up; moreover, it is a very agreeable amusement, especially when we discover any new plants. However, though we did not meet with many novelties, yet the hope of a good harvest made us advance briskly. It must be acknowledged, that the sight is very much deceived, when we stand at the bottom, and guess at the height of a mountain, and especially when it must be ascended through sand as troublesome as the Syrtes of Africa. It is impossible to take one firm step upon the sand of Mount Ararat, and in good philosophy one loses a great deal more motion than when one walks on firm ground. What a feast was it for those who had no water but what was in their bellies, to sink every step up to the ankle in sand! In many places, in-

stead of ascending, we were obliged to go back again down to the middle of the mountain, and, in order to continue our course, to wind sometimes to the right, and sometimes to the left. When we met with any mouse-ear, it made our boots as smooth as glass, and so slippery, that we were forced to stand still. In truth, we were two or three times about to have given up our design. And it had been better we had, than in vain to strive against such a horrible sand, and a mouse-ear so short, that the most hungry sheep could not brouze on it. However, the reflection that we had not seen all, would have given us uneasiness afterwards, and we should have been apt to fancy we had neglected the best places. It is natural to flatter ourselves in these sorts of inquiries, and to believe that we only want a lucky minute to find something extraordinary, which would make amends for all our pains. Besides, the snow which was always in our view, and which seemed to draw nearer to us, though, indeed, it was a great way off, attracted us very powerfully, and bewitched our eyes continually; and yet the nearer we approached it, the fewer plants we found.

To avoid the sand, which fatigued us intolerably, we took our way to the great rocks heaped on one another, like Ossa upon Pelion, to speak in the language of Ovid. We pass under them as through caverns, wherein we are sheltered from all the injuries of the weather, except the cold, which we felt there very sensibly, and served a little to allay our thirst. We were obliged to leave this place quickly, lest we should get a pleurisy; and came into a very troublesome way, full of stones, much like the stones used at Paris by the masons; and we were forced to leap from one stone to another. This exercise we found very tiresome, and we could not but laugh to see ourselves forced to take such methods, though in truth it was but from the teeth outwards. For my part, being quite tired out, and not being able to go

any farther, I first began to repose myself, which was an excuse for the rest of the company to do the like.

As the conversation is commonly renewed when we are sat down, one talked of the tigers which walked about very quietly, or played at a good reasonable distance from us. Another complained that he could not breathe; and for my own part, I never was more afraid that some lymphatic vessel was broken in my body. In fine, amidst all these little passages with which we endeavoured to amuse ourselves, and which seemed to give us new strength, we came about noon to a place more pleasing, for it seemed as if we were ready to take hold of the snow with our teeth. But our joy lasted not long; for what we had taken for snow was only a chalk rock, which hid from our sight a tract of land above two hours' journey distant from the snow, and which seemed to us to have a new kind of pavement, not of little flints, but small pieces of stone, broken off by the frost, and whose edges cut like flints. Our guides told us their feet were quite bare, and that ours would quickly be so too, that it grew late, and we should certainly lose ourselves in the night, or break our necks in the dark, unless we chose to sit ourselves down to become a prey to the tigers, who ordinarily make their chief attempts in the night; all which seemed very probable. However, our boots were not bad yet. After having looked on our watches, which we kept in very good order, we assured our guides that we would go no further than a heap of snow which we showed them, and which did appear to be hardly bigger than a cake. But when we came to it, we found more than we had need of; for the heap was above thirty paces in diameter. We every one eat more or less, as we had a mind; and by agreement resolved to advance no further. This snow was above four feet thick; and being frozen hard, we took a great piece to fill our bottle. It

cannot be imagined how much the eating of snow revives and fortifies. Some time after we felt a glowing heat in our stomachs, like that in the hands, after having held snow in them half a quarter of an hour; and far from causing griping pains, as most imagine it must, it was very comfortable to our inward parts. We descended, therefore, from the snow with a wonderful vigour, much pleased that we accomplished our desire, and we had now nothing farther to do but to retire to the monastery.

As one good fortune is generally followed by another, by chance I perceived a small green plant, which glittered among the ruinous fragments of stone. We ran thither as to a treasure, and were highly pleased with the discovery. It was an admirable species of veronica telephii folio: But we did not stay there long, our thoughts being now much taken up with our return; and our pretended vigour was not of long duration; for we came to sands which lay behind the abyss, and were full as troublesome as the former. When we endeavoured to slide along, half our bodies were buried; besides, we could not keep the direct way, but were obliged to go to the left to come to the edge of the abyss, of which we had a mind to take a nearer view. And, indeed, it is a most frightful sight. David might well say, such sort of places show the grandeur of the Lord. One cannot but tremble to behold it; and to look on the horrible precipices, ever so little, will make the head turn round. The noise made by a vast number of crows, who are continually flying from one side to the other, has something in it very frightful. To form any idea of this place, you must imagine one of the highest mountains in the world opening its bosom, only to show the most horrible spectacle that can be thought of. All the precipices are perpendicular, and the extremities are rough and blackish, as if a smoke came out of the sides, and smutted them. About six o'clock in the evening, we found ourselves

quite tired out and spent; and we were not able to put one foot before another, but were forced to make a virtue of necessity, and merit the name of martyrs to botany.

We at length observed a place covered with mouse-ear, whose declivity seemed to favour our descent, that is to say, the way Noah took to the bottom of the mountain. We ran thither in haste, and then sat down to rest ourselves; and found there more plants than we had all the journey beside. And what pleased us mighty well, was, that our guides showed us from thence, but at a great distance from us, the monastery whither we were to go to quench our thirst. I leave it to be guessed what method Noah made use of to descend from this place, who might have rode upon so many sorts of animals which were all at his command. We laid ourselves on our backs, and slid down for an hour together upon this green plat, and so passed on very agreeably, and much faster than we could have gone on our legs. The night and our thirst were a kind of spurs to us, and caused us to make the greater speed. We continued, therefore, to slide in this manner as long as the way would suffer us; and when we met with small flints which hurt our shoulders, we turned, and slid on our bellies, or went backwards on all fours. Thus, by degrees, we gained the monastery; but so disordered and fatigued by our manner of travelling, that we were not able to move hand or foot. We found some good company in the Monastery, the gates of which are open to every body for want of fastenings. The people of the town had taken a walk thither, and were just going away as we came; but to our great misfortune had neither wine nor water. We were, therefore, forced to send to the river; but had no vessel beside our leathern bottle, which held not above a quart. And what a punishment was it for the guide on whom the lot fell, to go to the river, and fill it? He had the happiness, indeed, to be the first

who drank; but nobody envied him. For he paid dear enough for it; the descent from the monastery to the river was near a quarter of a league downright, and the way very rugged. One may guess how pleasant his journey was back again. It took up half an hour to go and come; and the first bottle was almost drank out at one draught. The water seemed like nectar; but we were forced to wait another half-hour for a second bottle, which was misery enough. We took horse that night for the town, to get some bread and wine; for, after all the pains we had taken, we found our bellies very empty. We did not reach the town till about midnight; and he that kept the key of the church in which we were to lodge, was sleeping at his ease at the other end of the town. We were very happy now in having found some bread and wine. After this light supper, we got into a good sound sleep, without being disturbed by dreams, any uneasiness, or indigestion, or so much as in the least feeling the sting of the gnats.—*M. Tournefort's Travels.*

VOLCANOES.

THE most remarkable changes which have taken place in the form and constitution of the earth since the deluge, have probably been produced by subterraneous fires; for it is to their agency that philosophers ascribe volcanoes and earthquakes—those tremendous instruments of nature, by which she converts plains into mountains, the ocean into islands, and dry land into stagnant pools. When these fires were first kindled—by what sort of fuel they are still maintained—at what depths below the surface of the earth they are placed—whether they have a mutual communication—of what dimensions they consist—and how long they may continue:—are questions which do not admit of an easy decision.

Volcanoes generally exist in the vicinity of the sea,

or large lakes, and also break out from unfathomable depths below the sea, and form new islands with the melted lava and stones which they eject. When a volcano breaks out in a new situation, it forms a vast rent or fissure, through which lava and stones are thrown out, that soon choke up the passage, and confine the eruption to one or more openings, round which a conical mountain is formed, the open part of which is called the Crater.

The indications of an approaching eruption are, an increase of smoke from the summit, which sometimes rises to a vast height, branching in the form of a pine-tree. Tremendous explosions, like the firing of artillery, commence after the increase of smoke, and are succeeded by red-coloured flames and showers of stones. At length the lava flows out from the top of the crater, or breaks through the sides of the mountain, and covers the neighbouring plains with melted matter, which, becoming consolidated, forms a stony mass often not less than some hundred square miles in extent, and several yards in thickness. The eruption has been known to continue several months. The quantity of volcanic powder, called ashes, thrown out, is inconceivably great. During one eruption of Etna, a space of 150 miles in circuit was covered with a stratum of sand twelve feet thick. When the lava flows freely, the earthquakes and explosions become less violent, which proves that they were occasioned by the confinement of the erupted matter, both gaseous and solid. The smoke and vapour of volcanoes are highly electrical. The long period of repose which sometimes takes place between two eruptions of the same volcano, is particularly remarkable.

In the volcanic land, series of points may be traced, seemingly connected. The whole granitic chain which borders the Pacific is crowned with volcanoes, beginning at the Straits of Magellan, with the Andes, which, in Chili, has fourteen burning craters. Those

of Peru are most numerous and terrible, as are those of the isthmus of Mexico and California. The littoral chain to Alashka offers several volcanoes, some in activity. Others are found in that semicircular chain of islands between the continents, terminating near Kamtschatka, in which peninsula are five active volcanoes, besides many extinct craters, which reach to Dauria.

South of Kamtschatka, the ignivomous chain traces the Kourvilla Isles, Jesso, and Japan. A series of volcanic islets joins on the Marianne Isles, which have nine active volcanoes, and thence through Polynesia. Another branch runs south, by Lieou, Kiou, Formosa, Philippines, Indian Archipelago, and Australasia, to New Zealand, where remain equivocal signs of subterranean fires.

Several ramifications go off to the Indian Sea. In the Mauritius is an active volcano; the Isles of France and Madagascar, St. Paul and Amsterdam, are covered with leaves, ashes, and scoriæ; the mineral waters and confused mountains of the Cape of Good Hope indicate subterraneous fires. The Gebel Tar is an extinct crater, at the entrance of the Red Sea, between the ancient volcanoes of Upper Egypt and Syria, which join those of America and Caucasus, and the isles of the Archipelago, whose fires burst forth occasionally in the caverns of Lemnos, Milo, and Santorin.

The Ionian Isles, in the Adriatic, are volcanic, and ignivomous mountains, are on the coast. Sicily has its Etna, Naples its Vesuvius, and Strombolo in the islands of Lipari. All Italy offers vestiges of ancient volcanoes, by the Appenines; the coasts of Provence, where are the extinct craters of Olioules and Evenos; another on the Alps of Dauphiny; and in Spain are the solfataras, leaves, and puzzolanas in the environs of Burgos. All Upper Germany, between the Alps and Krapaks, indicates ancient volcanoes, especially in Bohemia, Hesse, Lusatia, Hungary, Silesia, &c.

Mount Atlas rests on volcanic ground, and also the islands of St. Helena and Assumption, composed of leaves and ashes; the Cape Verde Islands, of which Fuego always throws out flames; the Canaries, whose Peak of Teneriffe is a higher volcanoe than Etna; the Azores, incessantly disordered by submarine fires; the British Isles, with Ireland, famed for its Giants' Causeway; The Hebrides, the Feroe islands; and, finally Iceland, which terminates this long chain by Mount Hecla, a focus more active than Vesuvius. On the coast of America, Guadaloupe, Dominica, Trinidad, &c. have active craters.

In this great number of volcanoes, only those are ignivomous situated near the sea; the others were so when the ocean was not yet fixed in its actual basin. These ancient volcanoes, are not in a greater quantity on account of the unequal periods of their existence. Their fires ceased, as the ocean no longer bathed the sides of the craters, and others were formed, which disappeared from the same causes. Thus the extinct volcanoes indicate the successive retreat of the waters, and of the limits of their basin. But such observations are very incomplete; and even in the centre of Europe, doubts remain on the volcanic nature of some lands. The absence of volcanoes in the north, is consequent on those countries being the last abandoned by the sea, and too low for a focus to subterraneous fires. By comparing localities, the neighbourhood of the sea, and the elevation of the land, are necessary circumstances for this phenomenon. Hence, volcanoes are so terrible in the chain of the Cordilleras, so frequent in high islands, and so rare, or rather unknown, on low coasts.—*Shaw's Nature Displayed.*

ERUPTION OF VESUVIUS IN 1767.

Vesuvius was quiet until March 1767, when it began to throw up stones from time to time. In April the throes were more frequent, and at night fire was

visible on the top of the mountains; or, more properly speaking, the smoke which hung over the crater was tinged by the reflection of the fire within the volcano. These repeated throes increased the little mountain (which had previously been observed within, but not so high as the rim of the ancient crater) so much, that in May its top became visible above it. The 7th of August there issued a small stream of lava from a breach in the side of this little mountain, which gradually filled the valley between it and the ancient crater; so that on the 12th of September the lava overflowed the ancient crater, and took its course down the sides of the great mountain; by this time the throes were much more frequent, and the red hot stones went so high, as to take up ten seconds in their fall. Padre Torre, a great observer of Mount Vesuvius, says they went up above a thousand feet.

The 15th of October, the height of this little mountain, formed in about eight months, was measured by Don Andrea Pigonati, a very ingenious young man, in his Sicilian Majesty's service, who assured me that its height was 185 French feet. From my villa, situated between Herculaneum and Pompeii, near the Convent of Calmaldolese, I had watched the growing of this little mountain, and by taking drawings of it from time to time, could perceive it increase minutely. I make no doubt the whole of Vesuvius has been thrown up in a similar manner. The lava continued to run over the ancient crater in small streams, sometimes on one side and sometimes on the other, until the 18th when I took particular notice that there was not the least lava to be seen, owing, I imagine, to its being employed in forcing its way towards the place where it burst out the following day. As I had, contrary to the opinion of most people here, foretold the approaching eruption, and had observed a great fermentation in the mountain, after the heavy rains which fell on the 13th and 14th of October, I was not sur-

prised on the 19th following, at seven in the morning, to perceive from my villa, every symptom of the eruption being just at hand. From the top of the little mountain, issued a thick black smoke, so thick, that it seemed to have difficulty in forcing its way out; cloud after cloud mounted with a hasty spiral motion, and every minute a volley of great stones was shot up to an immense height, in the midst of these clouds. By degrees, the smoke took the exact shape of a huge pine-tree, exactly such as Pliny described in his letter to Tacitus. This column of black smoke, after having mounted an extraordinary height, bent with the wind towards Caprea, and actually reached over that island, which is not less than twenty-eight miles from Vesuvius. I warned my family not to be alarmed, as I expected there would be an earthquake the moment of the lava breaking out; but before eight in the morning, I perceived the mountain had opened a mouth without noise, about one hundred yards lower than the great crater, on the side towards the *Monte di Somma;* and I plainly perceived, by a white smoke which always accompanies the lava, that it had forced its way out. As soon as it had vent, the smoke no longer came out with so much violence from the top. As I imagined there would be no danger in approaching the mountain, as soon as the lava had found vent, I went up immediately, accompanied by one peasant only. Having passed the hermitage, and arrived at a place called *Atrio di Cavallo,* between the mountain of Somma and that of Vesuvius, I was making my observations on the lava, which had already reached the valley, when, on a sudden, I heard a violent noise within the mountain, and, about a quarter of a mile from the place where I stood, the mountain split. From this new mountain, a fountain of liquid fire shot up several feet high, and then, like a torrent, rolled on directly towards us. The earth shook, and at the same time a volley of pumice-stones fell thick upon us. In an instant, clouds of black smoke

and ashes caused almost a total darkness. The explosions from the top of the mountain were much louder than any thunder I ever heard, and the smell of sulphur was very offensive. My guide alarmed, took to his heels, and I must confess, I did not feel at all at my ease. I followed him close, and we ran nearly three miles without stopping, while the earth continued to shake under our feet. I was apprehensive of the opening of a fresh mouth, which might have cut off our retreat. I also feared that the violent explosions would detach some of the rocks off the mountain of Somma, under which we were obliged to pass; besides, the pumice-stones, falling on us like hail, were of such a size as at times to annoy us exceedingly. After having taken breath, as the earth still trembled greatly, I thought it most prudent to leave the mountain and return to my villa, where I found my family in great alarm, at the continual and violent explosions of the volcano, which shook our house to its foundation, the doors and windows swinging on their hinges. About two in the afternoon, another stream of lava forced its way from the same place that it had proceeded last year, so that now the conflagration was as great on this side of the mountain as on the other. The noise and smell increasing, we removed from our villa to Naples, and I thought proper, as I passed by Portici, to inform the court of what I had seen, and humbly offered it as my opinion, that his Sicilian majesty should leave the neighbourhood of the threatening mountain. The court, however, did not leave Portici until about twelve o'clock, when the lava had extended considerably. I observed in my way to Naples, which was less than two hours after I had left the mountain, that the lava had actually covered three miles of the very road through which we had retreated. It is astonishing it should have run so fast, as I have since seen that the river of lava in the Atrio di Cavallo was 60 and 70 feet deep, and in some places nearly two miles broad.

When his Sicilian majesty quitted Portici, the noise was greatly increased; and the confusion of the air, from the explosions, was so violent, that in the king's palace, doors and windows were forced open, and even one door there, which was locked, was nevertheless burst open. At Naples, the same night, many windows and doors flew open. In my house, which is not on the side of the town next Vesuvius, I tried the experiment of unbolting my windows, when they flew open upon every explosion of the mountain. Besides these explosions, which were very frequent, there was a continued, violent, and subterraneous rumbling noise, which lasted this night about five hours. I have imagined that this extraordinary noise might be owing to the lava in the bowels of the mountain having met with a deposition of rain water, and that the conflict between the fire and the water may in some measure account for so extraordinary a crackling and hissing noise. Padre Torre is also of my opinion; and indeed it is natural to imagine, that there may be rain water lodged in many of the caverns of the mountain, as in the great eruption of Vesuvius in 1663, it is well attested, that several towns, among which were Portici and Torre del Greco, were destroyed by a torrent of boiling water having burst out of the mountain with the lava, by which many thousand lives were lost. In Sicily, about four years ago, Mount Etna threw up hot water also during an eruption.

The confusion at Naples throughout the night cannot be described; his Sicilian majesty's hasty retreat from Portici added to the alarm. All the churches were opened and filled, and the streets thronged with processions of Saints. I shall avoid in this place, entering into a description of the various ceremonies which were had recourse to, in order to quell the fury of the turbulent mountain.

Next morning, it was impossible to judge of Vesuvius, from the smoke and ashes which covered it entirely, and extended over Naples, where the sun ap-

peared as if shining through a thick London fog, or a smoked glass. Small ashes fell all day at Naples. The lavas on both sides the mountain ran violently; but there was little or no noise until about nine o'clock at night, when the same rumbling began again, accompanied with explosions, and lasted about four hours. It seemed as if the mountain would split into pieces, and, indeed, another very considerable opening near its summit was made. The confusion in the city continued great throughout the night. The prisoners in the public gaol attempted to escape, but were prevented by the troops. The mob also set fire to the Cardinal-Archbishop's gate, because he refused to bring out the relics of Saint Januarius.

Next day was more quiet than the preceding, though the lavas burnt briskly. Portici was once in some danger, had not the lava taken a different course, when only a mile and a half distant from it. Towards night the lava streams abated.

The following morning, about ten o'clock, the same thundering noise again commenced, and even with more violence than on any of the preceding days. The oldest men declared they had never heard the like; and we were every moment fearfully expecting some dire calamity. The ashes,—or rather small cinders,—showered down so fast, that the people in the streets were obliged to use umbrellas, or flap their hats, to prevent the ashes injuring their eyes. The tops of the houses and the balconies were covered above an inch thick with cinders. Ships at sea, twenty leagues from Naples, were also covered with them, to the astonishment of the sailors. In the midst of these horrors, the mob grew impatient and tumultuous, and at length obliged the Cardinal to bring out the head of St. Januarius, and go with it in procession to the Ponte Maddalena, at the extremity of Naples, towards Vesuvius; and here, therefore, it is well attested, that the eruption ceased the moment the head of the saint came within sight of

the mountain. It is true, the noise ceased about that time, having lasted about five hours, as it had done the preceding days.

The next day the lava still ran; but the following it ceased. The three succeeding days, the mountain continued emitting stones and ashes. At one time the latter formed a vast column, as black as the mountain itself, and its shadow was reflected along the surface of the sea. Continual flashes of forked and zig-zag lightning shot from it, while its thunder was heard in the neighbourhood of the mountain. After this the smoke continued less thick, and finally disappeared. No signs of any further eruption then followed.—*Phil. Trans. Vol.* 58, *for the Year* 1768.

MOUNT ETNA.

We set out at three o'clock from Catania, and began our march in frightful roads through rocks of lava, which cover the first part of the route. We continued our journey in a road covered with lava, but bordered with superb Indian fig-trees. After proceeding five or six miles, we passed through the village of Gravelina, where I was assailed by nearly the whole population demanding charity. Some miles further we perceived, and afterwards passed through another village called Masca-Luscia. It contains two churches; one of which, nearly destroyed by an earthquake, was never very remarkable, and the other is only rendered so by a steeple fantastically decorated with stones of various colours. We arrived, in fine, at the last village, that of Nicolosi, which appeared poorer than all the rest. This was surely, in former times, the town of Etna, where the inhabitants of Catania took refuge on the arrival of the Greeks. The environs abound in olive trees and vineyards, which produce excellent wine. All this part was covered with ashes by the eruption of Monte Rosso, a secondary volcano, which formed itself at the time of the last eruption. Monte Rosso

is one of those mountains by which Etna is surrounded. It appears, when an eruption takes place, the lava, making its way on the flanks of the mountains, pierces the ground in the place which offers the least resistance, and there forms a swelling, which it afterwards consolidates, by flowing from above. In this village we found the guide, or, as he is called, the Pilot of Etna. After some conversation, he engaged to ascend for three piastres, about twelve shillings and sixpence. From thence to the convent where we were to rest our beasts, we had no more than a mile to go, which we performed by coasting along Monte Rosso, whose summit was gilded by the sun, and behind which it had already set when we arrived. This mountain is several miles in circumference. I profited by the last light of the sky in order to sketch a view of the convent, which, although of the common extent, is nevertheless picturesque. Built against a small hill, long since become cold, and covered with woods, it seems sheltered from the destructive effects of the volcano. From the other side, between superb fir-trees, you perceive the sea, the plains of Catania, and Syracuse. We were four hours in coming from Catania, which is notwithstanding only a distance of twelve miles. I slept here, and we set out at half-past nine, by moonlight. We first entered into an immense torrent of lava. The uncertain glimmerings of the moon gave an extraordinary aspect to the huge masses by which I was surrounded. Soon after, long shadows scattered here and there, and a trembling of the leaves, announced the approach to the forest of oaks, which formerly encircled Etna to the height of several miles, but which an immense torrent of lava had ravaged. We now entered into the most fantastical lavas; they have more of a slope, and the crevices which form these, as soon as they become cold, acquire more extent, and present a more rent appearance. Having arrived near a mass of snow which

filled one of the narrow passes of the mountain, a summit that looked black in the sky, made me believe that I was at the end of my journey. An old tower, which I took for the *Torre del Filosofo*, confirmed me in my error. I soon after perceived another summit, covered with a whitish smoke. I asked if it was much higher than the other. My guide affirmed that it was; and he was in the right; for it seemed to me to surpass the first in the whole height of Vesuvius. The road became more united, and the acclivity gentler. We coasted along a torrent of black lava, the more singular, as its elevation was from eight to ten feet, and perpendicular like a wall, which clearly proved to me that this matter, in flowing, is not in perfect fusion, as great part of the substances which it drags along are sufficiently hard to prevent their melting: and that they are, like the basalt, detached from the immense vaults which, during many ages, supported this natural forge. The sky began to adorn itself in the east, and we perceived the house called *les Anglais*. After a light breakfast, I directed my steps towards the place where, according to custom, the curious go to behold the rising sun.

I now bent my steps towards the last summit, which, covered with a light white smoke, seemed to move away from the impatient traveller. We walked nearly a mile on almost horizontal lava, or, to speak more correctly, on striated scoriæ or dross, which made a crackling noise under our feet, and soon after on a swamp of snow, where we found a large round stone, three feet in diameter, of the species of those called volcanic balls, which the mountain throws up in great eruptions; but it is only a grain of metal in comparison with the volcano which ejected it from its bosom. In fine, we mounted the last cone which supports the crater, the ashes and the stones slipping under our feet. The cold was excessive, but exercise kept us warm. I quitted my cloak, and rolling up

some pieces of lava in it, I left it on the mountain. At last we arrived on the borders of the crater; but the wind was so violent that I could scarcely cast a glance over it. I was thrown down; and had it not been for my *Cicerone*, I might have rolled to the foot of the declivity which had given us so much trouble to ascend. Fastened, and lying down at the ridge of the crater, I considered it at my ease, and braved the fury of Æolus and Vulcan.

It is a vast aperture, having four summits of different heights, rather more than a mile in width; and, on account of its inequalities, I should think it about four in circumference. It is divided into two craters by a cone rising from its centre, and which forms a crater itself, the cone of which is not very rapid. The ancient aperture is united to this cone by a gentle declivity, where has probably been formed, within a recent period, a small crater, a partial volcano, a perfect truncated cone, from whence issues a great quantity of smoke. The general aspect of the crater is much less dreary than that of Vesuvius; the substances surrounding it are not so black, but have rather the colour of potter's earth. I could not make the entire tour of the crater, on account of the violence of the wind, which prevented me also from descending into the interior, which appeared to me less rapid than that of Vesuvius.—*Monsieur Gourbillon's Travels in* 1819.

MOUNT HECLA—ITS ASCENT.

We rose at an early hour on the third of August, with the intention of ascending this mountain, whose fame had spread through every quarter of the globe. At ten o'clock we were ready; and having collected our horses, we mounted them, and began our expedition under circumstances as favourable as we could wish. We rode through sand and lava for about three miles, when the surface became too rugged and steep for horses. Our guide proposed leav-

ing the poor animals standing till we returned; but though they would not have stirred from the spot, we sent them back, not choosing such valuable and steady servants should remain a whole day without food. We now proceeded a considerable way along the edge of a stream of lava, and then crossed it where it was not very broad, and gained the foot of the south end of the mountain. From this place we saw several mounts and hollows, from which the streams of lava from below appeared to have flowed. While we had to pass over rugged lava, we experienced no great difficulty in advancing; but when we arrived at the steepest part of the mountain, which was covered with loose slags, we sometimes lost at one step, by their yielding, a space that had been gained by several. In some places we saw collections of black sand, which, had there been any wind, might have proved exceedingly troublesome. The ascent now became very steep, but the roughness of the surface greatly assisted us.

Before we had reached the first summit, clouds surrounded us, and prevented our seeing further than a few yards. Placing implicit confidence in our guide, we proceeded; and having attained what we thought was the nearest of the three summits, we sat down to refresh ourselves, when he informed us he had never been higher up the mountain. The clouds occasionally dividing, we saw we had not reached the southern summit. After having passed a number of fissures, by leaping across some, and stepping along masses of slags that lay over others, we at last got to the top of the first peak. The clouds now became so thick, that we began to despair of reaching farther. Indeed it was dangerous even to move; for the peak consists of a very narrow ridge of slags, not more than two feet broad, having a precipice on each side many hundred feet high. One of these precipices forms the side of a vast hollow, which seems to have been one of the craters.

At length the sky cleared a little, and enabled us to discover a ridge below, that seemed to connect the peak we were on with the middle one. We lost no time in availing ourselves of this opportunity; and, by balancing ourselves like rope-dancers, we succeeded in passing along a ridge of slags, so narrow that there was hardly room for our feet. After a short but very steep ascent, we gained the highest point of this celebrated mountain.

We now found that our usual good luck had not forsaken us; for we had scarcely begun to ascend the middle peak, when the sky became clear, and we had a fine and full view of the surrounding country. Towards the north it is low, except where a Jokul here and there towers into the regions of perpetual snow. Several large lakes appeared in different places, and among them the Fiske Vatn was the most conspicuous. In this direction, we saw nearly two-thirds across the island. The Blæfall and the Large Jokuls stretched themselves in distance to a great extent, presenting the appearance of enormous masses of snow heaped up on the plains. The Skaptaa Jokul, whence the great eruption that took place in 1783 broke forth, bounded the view towards the north-east. It is a large, extensive, and lofty mountain, and appeared to be covered with snow to the very base. On the side next to us, though at a distance of about forty miles, we plainly discerned a black conical hill, which very probably may be the crater that was formed during the eruption. The Torfa, Tinfialla, and Eyafialla Jokuls, limit the view of the eastern part of the country. Towards the south, the great plain we had passed through seemed as if stretched under our feet, and was bounded by the sea. The same valley was terminated, towards the west, by a range of curiously peaked mountains —those in the neighbourhood of Thingualla, and to the north and west of the Geysers.

The middle peak of Hecla forms one side of a hol-

low, which contains a large mass of snow at the bottom, and is evidently another crater. The whole summit of the mountain is a ridge of slags, and the hollows on each side appear to have been so many different vents, from which the eruptions have from time to time issued. We saw no indication that lava had flowed from the upper part of the mountain; but our examination, from the frequent recurrence of fog, was unavoidably confined.

After we had satisfied ourselves with viewing the surrounding country, we began to collect specimens of the slags, and perceived some of them to be warm. On removing some from the surface, we found those below were too hot to be handled; and on placing a thermometer amongst them, it rose to 144°. The vapour of water ascended from several parts of the peak. It had been remarked to us by many of the inhabitants, that there was less snow on Hecla at this time than had been observed for many years. We supposed, therefore, that the heat now noticed might be the recommencement of activity in the volcano, rather than the remaining effects of the last eruption, which took place in the year 1766. Letters from Iceland, dated the 24th of October, mention that, on the morning of that day, a shock of an earthquake was felt. This, however, does not always indicate an approaching eruption.

The crater, of which the highest peak forms a part, does not much exceed a hundred feet in depth. The bottom is filled by a large mass of snow, in which various caverns had been formed by its partial melting. In these the snow had become solid and transparent, reflecting a blueish tinge; and their whole appearance was extremely beautiful, reminding us of the description of magic palaces in Eastern tales.

At the foot of the mountain, at nine o'clock, the thermometer stood at 59°; at eleven it was 55°; and at four, on the top, at 39°. Our descent was greatly retarded by thick fog, and we found it much more

hazardous than the ascent. We missed our way, and were under the necessity of crossing the lava we had passed on our way up, at a place where it had spread to a much greater breadth, and, from the rapidity of the slope along which it had flowed, had become frightfully rugged.—*Sir G. Mackenzie's Travels in Iceland.*

SULPHUR MOUNTAINS.

THE 25th was a delightful day, and having taken an early breakfast of biscuit, cheese, and milk, we set out towards the Sulphur Mountain, which is about three miles distant from Krisuvik. At the foot of the mountain was a small bank composed chiefly of white clay, and some sulphur, from all parts of which steam issued. Ascending it, we got upon a ridge immediately above a deep hollow, from which a profusion of vapour arose, and heard a confused noise of boiling and splashing, joined to the roaring of steam escaping from narrow crevices in the rock. This hollow, together with the whole side of the mountain opposite, as far up as we could see, was covered with sulphur and clay, chiefly of a white or yellowish colour. Walking over this soft and steaming surface we found to be very hazardous; and I was frequently very uneasy when the vapour concealed my friends from me. The day, however, being dry and warm, the surface was not so slippery as to occasion much risk of our falling. The chance of the crust of sulphur breaking, or the clay sinking with us, was great, and we were several times in danger of being much scalded. Mr. Bright ran at one time a great hazard, and suffered considerable pain, from accidentally plunging one of his legs into the hot clay. From whatever spot the sulphur is removed, steam instantly escapes; and in many places the sulphur was so hot, that we could scarcely handle it. From the smell, I perceived that the steam was mixed

with a small quantity of sulphuretted hydrogen gas. When the thermometer was sunk within the clay, it rose generally to within a few degrees of the boiling point. By stepping cautiously, and avoiding every little hole from which steam issued, we soon discovered how far we might venture. Our good fortune, however, ought not to tempt any person to examine this wonderful place without being provided with two boards, with which any one may cross every part of the banks in perfect safety. At the bottom of this hollow we found a caldron of boiling mud, about fifteen feet in diameter, similar to that on the top of the mountain which we had seen the evening before; but this boiled with much more vehemence. We went within a few yards of it, the wind happening to be remarkably favourable for viewing every part of this singular scene. The mud was in a constant agitation and often thrown up to the height of six or eight feet. Near this spot was an irregular space filled with water, boiling briskly. At the foot of the hill, in a hollow formed by a bank of clay and sulphur, steam rushed with great force and noise from among the loose fragments of rock. Further up the mountain we met with a spring of cold water, a circumstance little expected in a place like this. Ascending still higher, we came to a ridge composed entirely of sulphur and clay, joining two summits of the mountain. Here we found a much greater quantity of sulphur than on any other part of the surface we had gone over. It formed a smooth crust from a quarter of an inch to several inches in thickness. The crust was beautifully crystallized. Immediately beneath it we found a quantity of loose granular sulphur, which appeared to be collecting and crystallizing, as it was sublimed along with the steam. Sometimes we met with clay of different colours, white, red and blue, under the crust; but we could not examine this

place to any depth, as the moment the crust was removed steam came forth, and proved extremely annoying. We found several pieces of wood, which were probably the remains of planks that had been formerly used in collecting the sulphur, small crystals of which partially covered them. There appears to be a constant sublimation of this substance, and were artificial chambers constructed for the reception and condensation of the vapours, much of it might probably be collected. As is it is, there is a large quantity on the surface, and by searching, there is little doubt that great stores may be found. The inconvenience proceeding from the steam issuing on every side, and from the heat, is certainly considerable; but by proper precautions, neither would be felt so much as to render the collection of the sulphur a matter of any great difficulty. The chief obstacle to working these mines is, their distance from any port whence the produce could be shipped. But there are so many horses in the country, whose original price is trifling, and whose maintenance during summer costs nothing, that the conveyance of sulphur to Reikiavik presents no difficulties which might not probably be surmounted. Below the ridge, on the farther side of this large bed of sulphur, we saw a great deal of vapour escaping with much noise. We crossed to the side of the mountain opposite, and found the surface sufficiently firm to admit of walking cautiously upon it. We had now to walk towards the principal spring, as it is called. This was a task of much apparent danger, as the side of the mountain, for the extent of about half a mile, is covered with loose clay, into which our feet sunk at every step. In many places there was a thin crust, below which the clay was wet, and extremely hot. Good fortune attended us, and we reached, without any serious inconvenience, the object we had in view. A dense column of steam,

mixed with a little water, was forcing its way impetuously through a crevice in the rock, at the head of a narrow valley or break in the mountain. The violence with which it rushes out is so great, that the noises thus occasioned may often be heard at the distance of several miles; and during the night, while lying in our tent at Krisuvik, we more than once listened to them with mingled awe and astonishment. Behind the column of vapour was a dark-coloured rock, which gave it its full effect. It is quite beyond my power to offer such a description of this extraordinary place, as to convey adequate ideas of its wonders or its terrors. The sensations of a person, even of firm nerves, standing on a support which feebly sustains him, over an abyss where literally fire and brimstone are in dreadful and incessant action—having before his eyes tremendous proofs of what is going on beneath him—enveloped in thick vapours, his ears stunned with thundering noises:—these can hardly be expressed in words, and can only be well conceived by those who have experienced them.—*Sir G. Mackenzie's Travels in Iceland.*

VOLCANIC ORIGIN OF THE AZORES.

THE whole range, it is evident, is of comparatively recent sub-marine volcanic formation; symptoms of which are manifested to the geologist at almost every step, by the actual condition of the surface, which bears constant marks of being formed by the violent and terrific agency of fire. By these tremendous means, in fact, all the islands have been, at various unknown periods, forced up from the sea. From this general rule, however, may be excepted that of Santa Maria—which, although it has, like the rest of the Azores, been forced above the level of the sea by volcanic action, no where bears traces of the effects of fire on its surface. The effects of these

awfully sublime movements of nature give rise to appearances, on the face of a country, of the most peculiar kind; and nothing can be more interesting than the characteristics of those islands.

VORACITY OF A SHARK.

An instance of the voracity of the shark, has lately been known at St. Helena, in the fact of an artillery-man, entire and with his clothes on, being found in the belly of a large one!

SOMNIFEROUS EFFECTS OF LIME.

In the winter of last year a drover laid himself upon the platform of a lime kiln, placing his feet which were benumbed with cold, upon a heap of stones newly put in to burn the night. Sleep overcame him in this situation, the fire gradually rising and increasing until it ignited the stones upon which his feet were placed. Lulled by the warmth, he slept on; and although the fire increased until it burnt one foot and part of the leg entirely off, consuming that part so effectually, that no fragment of it was ever discovered, the wretched being continued to sleep; and in this state was found by the kiln-man in the morning. Insensible to any pain, and ignorant of his misfortune, he attempted to rise, and pursue his journey; but missing his shoe, requested to have it found: and when he was raised, putting his burnt limb to the ground to support his body, the extremity of his leg bone crumbled into fragments, having been calcined into lime! Still however he expressed no sense of pain. The poor fellow survived his misfortune about eight days; but an inflammation having extended to other parts of his body, he was mercifully relieved by death.

CURIOUS FACT.

SIGNOR ROSELLINI, a few months since, showed a friend at Florence, a sort of smelling bottle, evidently of Chinese porcelain, and with characters, to all appearance, Chinese! This was found by Rosellini himself in a tomb, which as far as could be ascertained, had not been opened since the days of the Pharaohs!

ST. PETER'S AT ROME.

THE cathedral church of St. Peter's, at Rome, is esteemed a master-piece of modern architecture, and strikes the spectator with admiration and pleasing astonishment. The circular area which lies before this magnificent edifice, is encompassed by a beautiful peristyle or colonnade, consisting of 284 marble pillars of the Doric order, which support an architrave, adorned with a vast number of statues of saints and martyrs. The obelisk already mentioned, and a fine fountain on each side of it, are great additions to the beauty of this spacious court, from whence there is a flight of steps to a grand terrace, that leads into the lofty portico before the church. Over this portico, which is supported by pillars 18 feet in circumference, are the statues of our Saviour and the twelve apostles; and there is also a fine balcony, where the popes are crowned in, in view of all the people. The body of the church, as well as the cupola, which is adorned with curious Mosaic work, is sustained by large square pillars, like those of St. Paul's cathedral in London; and under the middle of the cupola stands the high altar, which is 90 feet in height, being a kind of pavilion, supported by four wreathed columns of brass, adorned with foliage; and on the top of the canopy are four angels of gilt brass, holding festoons of flowers, most beautifully

carved; and between them are figures of children playing on the cornice.

The ascent to the dome is by a winding staircase, and from thence to the ball, by an incommodious flight of stairs, which lies between the outer and inner dome. The height from the pavement to the top of the cross is 432 feet, and the diameter of the ball is 80 feet 4 inches. St. Peter's chair is made of gilded brass, and supported by four gigantic figures, representing four fathers of the church, with a glory over them, extending quite to the roof. Under this chair is an altar, and on each side are stately monuments of brass and marble, of excellent workmanship. It is scarcely possible to describe the riches and beauty of the little chapels and altars round this church; yet the gilding, carving, paintings, embossed work, brass and marble statues, &c., are so well contrived and disposed, that the abundance occasions not the least confusion, nor does any thing appear superfluous. But among all the ornaments of this cathedral, none deserves our attention more than the Mosaic pictures which represent several pieces of scriptural and ecclesiastical history, and exceeds any thing of that kind that was ever done by the ancients.

Here it may be proper to inform the reader, that Mosaic work is an assemblage of little pieces of glass, marble, or precious stones, of various colours, cut square, and cemented on a ground of plaster, imitating the natural colours and gradations of painting. In this sense, it includes inlaid work, veneering, &c.; but in its more proper and restrained sense, it only comprehends works of stone, metals, and glass, those of wood being distinguished by the name of marquetry. The Mosaic of marble, which at present is most in use, serves for the pavements of churches and palaces, and the incrustations of the walls of the same edifices; but that of precious stones is so expensive, that it is seldom used unless

in small works, such as ornaments for altar-pieces, rich tables, &c. The Mosaic work so much admired in St. Peter's, is done with coloured glass, which kind, though now but little used, is extremely brilliant and durable. It is laid on a sort of plaster, composed of lime, fine brick-dust, gum-tragacanth, the white of eggs, and other ingredients; the pieces of glass being arranged with so much justness, and the light and shadow so well observed, that they appear as smooth as a table of marble, and as highly finished as a painting in fresco, with this advantage, that they have a fine lustre, and will last almost for ever, whereas time effaces all other kinds of painting. There is another sort of Mosaic work, of a more modern invention than any of the former, made with a kind of gypsum or talc, found in the stone quarries near Paris. Of this talc, calcined in a kiln, beaten in a mortar, and sifted, they form a sort of artificial marbles, imitating precious stones, and of these compose a Mosaic work, little inferior to the natural stones, either in point of lustre or durability.

Mr. Smollet, speaking of this church, in his travels through Italy, says, the Piazza is altogether sublime. The double colonnade on each side extending in a semicircular sweep, the stupendous Egyptian obelisk, the two fountains, the portico, and the admirable facade of the church, form such an assemblage of magnificent objects as cannot fail to impress the mind with awe and admiration: but the church would have produced a still greater effect, had it been detached entirely from the buildings of the Vatican. It would then have been a master-piece of architecture, complete in all its parts, entire and perfect; whereas at present, it is no more than a beautiful member, attached to a vast undigested and irregular pile of building. The great picture of Mosaic work, and that of St. Peter's bark, tossed by the tempest, which appear over the gate of the church, though rude in comparison with modern pieces, are

nevertheless great curiosities, when considered as the work of Giotto.

The tribune of the great altar, consisting of four wreathed brass pillars, gilt, supporting a canopy, is doubtless very magnificent, but rather overcharged with sculpture, fluting, foliage, festoons, and figures of boys and angels, which, with the hundred and twenty-two lamps of silver continually burning below, serve to dazzle the eyes, and kindle the devotion of the ignorant vulgar, rather than to excite the admiration of a judicious observer.

There is nothing, however, in this famous structure so worthy of applause as the admirable symmetry and proportion of its parts. Notwithstanding all the carving, gilding, basso-relievos, medallions, urns, statues, columns, and pictures, with which it abounds, it does not on the whole, appear over-crowded with ornaments. When you first enter, your eye is filled so equally and regularly, that nothing appears stupendous, and the church seems considerably smaller than it really is. The statues of children, that support the fonts of holy-water, when observed from the door, seem to be of the natural size; but as you draw near, you perceive they are gigantic. In the same manner, the figures of the doves, with olive-branches in their beaks, which are represented on the wall, appear to be within your reach; but as you approach them, they recede to a considerable height, as if they had flown upwards to avoid been taken.—SMITH'S *Wonders.*

ST. PAUL'S, LONDON.

THIS magnificent Cathedral, one of the finest protestant churches in the world, built in the purest style of Grecian architecture, stands upon an eminence to the north of the river Thames. The first stone was laid by Sir Christopher Wren, on the 21st of June, 1675, in the reign of King Charles II.; the

design was completed in 1710, but the decorations were not finished till the year 1723.

This cathedral is built of fine Portland stone, after the model of St. Peter's at Rome; having two ranges of pilasters on the outside, one above another, the lower range of the Corinthian order, and the upper of the Composite. The spaces between the arches of the windows, and the architecture of the pilasters, are filled up with various decorations.

The west front is beautified with a most magnificent portico, supported by twelve massy columns of the Corinthian order, and over those are eight composite columns, supporting a beautiful pediment, in which the history of St. Paul's conversion is cut in bas-relief. The ascent to this portico is by a flight of black marble steps; and over each corner of this front is an elegant turret. On the south side of the church is a portico with a dome, supported by six columns, and on the pediment is a phœnix in flames, with the word *resurgam* carved underneath it. The north portico corresponds with that on the south, and its pediment is embellished with the royal arms and other ornaments.

In the centre of the building rises a stupendous dome or cupola; and about twenty-five feet above the roof of the church is a circular range of columns, terminated by an entablature which supports a handsome gallery, adorned with a stone balustrade. On the summit of the dome is an elegant balcony, from which rises a beautiful lantern, adorned with Corinthian columns, and the whole is terminated by a gilt ball and cross.

On the inside, the cupola is supported by eight stupendous pillars curiously adorned; the roof of the choir is supported by six pillars, and the roof of the church by two ranges, consisting of twenty more.

Round the inside of the cupola runs a handsome iron gallery, where a whisper or even the ticking of

a watch may be heard distinctly at the distance of a hundred feet.

The top of the dome is finely painted by Sir James Thornhill; the floor of the choir is paved with marble, and the altar is adorned with four pilasters, painted and veined with gold, in imitation of *lapis lazuli*.

The length of this cathedral from east to west, including the portico is 500 feet: its breadth including the north and south porticos, 311; and its height, from the ground to the top of the cross is 344 feet.

This pile of building occupies an area of six acres, and is railed round with an iron balustrade, which is said to have weighed nearly three hundred tons, and to have cost upwards of £11,000. The whole expense of building the cathedral amounted to £736,752 2s. 3d.

The clock-works are well deserving the attention of the curious. The fine-toned bell which strikes the hours, is clearly distinguishable from any other in the metropolis, and has been distinctly heard at the distance of 20 miles. The weight of the bell is 11,474 pounds. The clock-dial is 57 feet in circumference. The length of the minute-hand is eight feet. A model of the latter is kept in the gallery leading to the library, for the inspection of the curious.—SMITH'S *Wonders, and* RIVINGTON'S *Description.*

THUNDER AND LIGHTNING.

THUNDER and lightning were formerly supposed to be produced by exhalations, raised by the sun from different substances on the earth; as nitre, sulphur, &c. which mixing in the atmosphere by the collision of different clouds and opposite currents of air, caught fire and darted out into a train of light. This notion was sanctioned by the well known circumstance, that

various liquids when mixed together (though cold before) immediately inflame; such as spirit of vitriol (sulphuric acid) mixed with oil of cloves, &c.

But thunder and lightning (the former only being the noise occasioned by the air rushing in to fill up the vacuum in the atmosphere produced by the passage of the latter) are now attributed to electricity; and seem, from the experiments of Dr. Priestley, Dr. Franklin, Dr. Bevis, Lord Stanhope, and others, to be sufficiently established.

Dr. Franklin, to whom the world is so much indebted for his zeal and ingenious discoveries on this subject, about the end of 1740 conceived the practicability of drawing lightning from the clouds. Various circumstances of resemblance between lightning and electricity were remarked by this ingenious philosopher, which his experiments have abundantly proved; such as the following: flashes of lightning are usually seen crooked and waving in the air; so the electrical spark drawn by an irregular body, or through which the best conductors are dispersed in an irregular manner, always exhibits the same appearance. Lightning strikes the highest and most pointed objects in its course, in preference to others, as hills, trees, spires, masts of ships, &c.; so all pointed conductors receive and throw off the electric fluid more readily than those that terminate in a flat surface. Lightning is observed to take and follow the readiest and best conductor; and the same is the case with electricity in the discharge of the Leyden phial; whence the doctor infers, that in a thunder-storm, it would be safer to have one's clothes wet than dry; the middle of a room or the cellar is the safest place in the house; and lying flat down on the ground at some distance from any high object may be the safest situation in the field. Lightning burns, dissolves metals, rends some bodies, sometimes strikes persons blind, destroys animal life, deprives magnets of their virtue or reverses their poles; it also gives

polarity to the magnetic needle, and to all bodies that have iron in them, as bricks, &c.

Persons are sometimes killed without any visible marks of injury being seen on them, and even without the lightning touching them; this is occasioned by the vacuum which the passage of the electric fluid makes, and which, drawing all the air out of the lungs leaves the body unsupported and the life is destroyed; sometimes the bones are all broken by the pressure of the external atmosphere. It is evident that the nearer we are to the cloud that is charged with the electric fluid the danger is the greater. But although the tempest be at a considerable distance from us, yet it may be connected with a cloud near at hand. Numerous instances are recorded of men and animals being killed, although at a great distance from the principal electric cloud. These effects Lord Stanhope attributes to what he calls the electrical returning stroke.

It has been erroneously supposed that lightning is always succeeded by a thunder-clap; but the kind of lightning (or perhaps more properly meteors) which is seen on a summer's evening is not attended with thunder, nor is there any danger to be apprehended from it; there are also flashes that appear with long trains in the night time where there is no cloud in view, and not attended by any explosion. The phenomena of lightning are always surprising, and sometimes terrible; neither is there any kind of natural appearance in which there is more diversity, no two flashes being observed alike or exactly similar to each other; when accompanied with thunder it may be observed, 1. In a zig-zag form. 2. In the form of the letter V, making only one angle, but having several branches. 3. Sometimes it appears like the arch of a circle. 4. At others, like balls of fire, in which form it is considered as the most destructive, and that in the zig-zag the next, in formidable effects. 5. In a great thunder-storm it is common to see flashes un-

attended by any report, and these differ in their appearance from the other sorts, being generally broad like a sheet.

The colour of the lightning also indicates in some measure its power; the palest and brightest flashes being most destructive; such as are red, or of a darker colour, commonly doing less damage.

A very surprising property of lightning, of the zig-zag kind, especially when near, is its seeming omnipresence. If two persons standing in a room looking different ways, and a loud clap of thunder accompanied with zig-zag lightning happens, they will both distinctly see the flash at the same time; not only the illumination, but the very form of the lightning itself, and every angle it makes in its course, will be as distinctly perceptible, as though they had both looked directly at the cloud from whence it proceeded. If a person happened at that time to be looking on a book, or other object which he held in his hand, he would distinctly see the form of the lightning between him and the object at which he looked. This property seems peculiar to lightning, and not to any other kind of fire whatever.

It is generally admitted, as has already been observed, that lightning spends its amazing power on high objects, such as mountains, steeples, trees, &c. This, however, is not always the case, as was exemplified on Wednesday the 13th of August, 1806, in a dreadful tempest of thunder and lightning that passed over London, between 9 and 11 in the forenoon; when in two instances it struck the ground first, near the house of James Meyrick, Esq. on Wimbledon Common. In the first instance, it struck the ground near a fine elm tree, upwards of 50 feet in height; which the lightning ascended for about 25 feet, stripping the bark off in a waving tract of about 15 inches in breadth, tapering a little to the top, without destroying the tree, which continued to flourish. In the second instance, it struck a large birch at the distance

of 130 yards from the former, stripping the bark off the trunk quite round, spending itself in points, among the branches; this tree immediately perished.

The necessity and utility of pointed conductors of electricity on buildings have been often demonstrated. The following directions have been given for erecting them: 1. That the conducting rods be made of such substances as are, in their nature, the best conductors of electricity. 2. That they should be uninterrupted, and perfectly continuous. This is a very material circumstance. One entire piece of metal cannot perhaps be had: but it is not sufficient that the rods, of which the conductor consists, be sensibly in contact; they should be pressed into actual contact by means of nuts and screws, with a thin piece of sheet lead between the shoulders of the joints. 3. That the rod be of sufficient thickness.—A copper one half an inch square, or an iron rod one inch square, or one of lead two inches square, are deemed sufficient. 4. That it be perfectly connected with the common stock; that is, it should be carried deep into the earth, which is frequently dry near the surface; and then continued in a horizontal direction, so as to have the farther extremity dipped, if practicable, into water, at the distance of ten yards or more from the foundation. 5. That the upper extremity of the rod be as acutely pointed as possible.—This termination should be of copper; or rather a very fine and exceedingly acute needle of gold should be employed, which will not materially add to the expense. 6. That it be very finely tapered, so that the upper extremity may be a cone, the diameter of the base of which may bear an extremely small proportion to its height; for instance, that of one to forty. 7. That it may be extremely prominent; that is, 8, 10 or 15 feet at least above the highest parts of the building; great importance is attached to this circumstance. 8. That each rod be carried in the shortest convenient direction, from its top to the extremity in the earth. 9. That there be

neither large nor prominent bodies of metal upon the top of the building proposed to be secured, but such as are connected with the conductor, by some proper metallic communication. 10. That there be a sufficient number of high and pointed rods. On edifices of great importance, especially magazines of gunpowder; the rods ought never to be above 40 or 50 feet asunder. It is believed that if these requisites are attended to, they will secure any building. It is to Dr. Franklin that we are indebted for the original idea of thus protecting buildings. In June, 1752, he demonstrated, by actual experiment, the identity of the electric fluid with lightning. He contrived to bring lightning from the clouds, by means of a paper kite properly fitted up for the purpose, with a long fine wire string, and called it an electric kite, which he raised when a thunder cloud was perceived approaching; and with the electricity thus produced, he charged several phials, kindled spirits of wine, and performed all the phenomena usually exhibited by the electrical apparatus.—*The World Displayed.*

SINGULAR EFFECTS OF LIGHTNING.

At a late sitting of the Institute, the following communication was made by M. Verges. On the 20th of last March, the lightning struck a man whilst in the field, and sitting quietly against a wall; the electric fluid entered apparently between the neckerchief and the skin, at the right side of the back part of the neck, and proceeded over the arm to the hand. Its principal effect was, however, on the dorsal and lateral surface of the chest; in the lumbar region, it had turned towards the navel, and thence to the abdomen, to the genital organs, and the legs down to the toes. In the whole of its course, the lightning appeared only to have affected the integuments, which were black, covered with phlystanæ, and in numerous places perforated; the epidermis was in many parts, to a greater or less extent, completely de-

stroyed; the hair of all the parts struck by the lightning was burnt. The lesion of the skin very much resembled a burn, and also caused a similar pain; a large portion of the dress was destroyed or damaged, the shirt being almost completely burnt. At the outer side of the shoe, whence the lightning seemed to have entered the ground, there was a cleft of about three inches in length. Neither during nor after the accident did the man loose his senses, and he declared that at the moment of the concussion, he had the full consciousness of what had happened to him. His nervous system did not appear in any respect to be affected; the pulse was regular, and there was no fever; he complained only of violent pain in the wound, and excessive thirst, and felt as if constantly enveloped in fire, &c.—*Lancet*; June, 1830.

PREVENTION OF THUNDER AND HAIL-STONES.

A Mr. Hart, of Nottingham, pledges himself to prevent thunder and hail-stones so completely, that, within the bounds of superintendence, neither of these shall ever occur; His plan is to inflate a few small silk balloons with *carbonated hydrogen* gas; and by fixing a set of points at the top of these, and connecting them with a chain to each which would reach the earth, and being insulated with a silk cord, would form a paragrele. A few of these, if placed at the distance of half a mile in a circle, would draw down the electricity in streams, so as to prevent any larger collection of it in the atmosphere, and, consequently, prevent not only thunder and hail, but, as he thinks, rain and dew, while every cloud would be dissipated within the influence of the balloons.

FOSSIL HUMAN FOOT.

In the year 1835, so one learns by a letter from the Archdeacon Kirchner, of Soran in Lower Lusatia,

was found the anthropolite in question, a vestige of antediluvian times, in the lime pits at Sorran, at the depth of ten ells (between eighteen and nineteen feet), in conjunction with the petrified remains of several extinct animals, such as the *trilodite*, the *orthoceratite*, *mammoth*, and particularly an unique nocturnal butterfly, of which no living specimen is known to exist. This anthropolite, which is become a complete mass of limestone, consists of a very short but extremely muscular foot, in a perfect state of preservation, with all the toes adhering to it: and none are more distinguishable than the large toe, from which the nail is torn off; the vestiges of the latter were lying near it; the bones, heels, muscles, and other parts of the foot, are likewise extant; the shin bone and knee, together with the main bone, and knee pans, *(aepfeln)* were found at the same time. The most striking deviations from the human conformation of the present day, which are here observable are,—first, the disproportion between so extremely muscular a foot, and its unusual shortness and thickness, in which respect it closely resembles a Chinese foot. Secondly, the extreme shortness of the shin bone, *(tibia;)* and thirdly, the uncommon size of the knee. The foot itself is the right one. The skull and other bones have not yet been discovered; but great hopes are entertained that they will.

ATMOSPHERICAL PRESSURE.

THERE are many new and interesting facts which shew that the human frame can habituate itself to very different degrees of atmospherical pressure without impairing its energies. Dr. Hume Weatherhead mentions in his work on head-aches, that on the summit of Mont Blanc, the celebrated Saussure scarcely had strength to consult his instruments; while at a height equal to this in South America,

young females will dance for a whole night without being extraordinarily fatigued. The battle at Pinchinca, in the late war of independence, was fought at an elevation equal to that of Monto Rosa, that is, between 15 and 16,000 feet above the level of the sea.

MIND AND BODY.

UPON this wonderful subject Lord Brougham says:—"The strongest of all arguments, both for the separate existence of mind, and for its surviving the body, is drawn from the strictest inductions of facts. The body is constantly undergoing change in all its parts. Probably no person at the age of twenty has one single particle in any part of his body which he had at ten; and still less does any portion of the body he was born with continue to exist in or with him. All that he before had has now entered into new combinations, forming parts of other men, or of animals, or of vegetable and mineral substances, exactly as the body he now has will afterwards be resolved into new combinations after his death. Yet the mind continues one and the same, 'without change or shadow of turning.' None of its parts can be resolved; for it is one and single, and it remains unchanged by the changes of the body. The argument would be quite as strong though the changes undergone by the body were admitted not to be so complete, and though some small portion of its harder parts were supposed to continue with us through life."

WONDERFUL CALF.

AT Pontefract, on the 3rd of October, 1830, a cow belonging to Mr. Sudbury, of that place, brought forth a full-grown calf with two heads, two breasts,

two necks, four fore-legs, two hearts, two livers and lights, two back-bones, which were separated as far as the sixth rib from the issuing bone, where they became joined into one back, two tails, and only two hind legs, each body possessing separate intestines quite perfect.

ORIGIN OF THE STOCKING-LOOM.

In a pamphlet by Aaron Hill, published in the year 1715, is the following narrative:—

It is not out of some men's remembrance, that a young gentleman of no fortune, a student of Oxford, fell in love with an innkeeper's daughter of that town, whose circumstances were also very narrow. He had philosophy enough to despise superfluous wealth, and judgment to foresee the necessity of a competence; but love was headstrong, and too hard for reason; so that, after a year or two's ineffectual delay, they bade defiance to their stars, and had courage enough to marry! the scholar gained a wife, and lost a fellowship, the only small subsistence he before depended on.

Our innkeeper often upbraided the bridegroom with the barren effects of his learning, and thought it very strange, as he well might, that while every body told him his son-in-law was a great scholar, his whole stock of knowledge could not help him to one penny of his own getting.

Six or seven months after this marriage, the father-in-law died, miserably poor,—and the credit which his industry maintained in his lifetime, dying with him, the goods he left behind were seized on by his creditors, and the student and his young wife turned out of doors, to eat the bread of fortune where they could find it.

The wife had a relation in town, unable to contribute any great assistance. She took them, however

into a garret of her house, where the man could only waste his hours between books and sighs, while the partner of his sorrows made hard shift to pick up a support by knitting stockings, at a certain common price for every pair.

At last, by a very natural coincidence, the cares of the lady became more *weighty*, and the patience of both less fortified. The only subject of their conversation now was the dread of what would become of the poor infant who was to be born a beggar; but sitting constantly together from morning till night, the scholar often fixed his eyes, with stedfast attention, on the motion of his wife's fingers, in the dexterous management of the needles; he took it into his imagination that it was not impossible to contrive a little loom, which might do the work with much more expedition.

The thought he communicated to his wife; and joining his head to her hands, the endeavour succeeded to their wishes. Thus the ingenious stocking-loom, which is so common now, was first invented, by which the inventor did not only make himself and his family happy, but has left his nation indebted to him for a benefit which enables us to export silk stockings in great quantities, and to a vast advantage, to those very countries from whence before we used to bring them at considerable loss in the balance of our traffic.

ROYAL OBSERVATORY, COPENHAGEN.

THIS Observatory is upon the top of a round tower, which was erected in 1637, after a plan given by Longomontanus. It is sixty feet in diameter, and a hundred and fifty feet high. The inscription is semi-hieroglyphical, explained as follows:—'Doctrinam et justitiam dirige, Ichova, in Cordem Coronati Ghristiani quarti, 1642.' We mounted the greatest part of the way by an ascent without steps, and from thence

to the summit of a small wooden staircase. A carriage can go as far as this place, but not to the platform, which some, in their description of it, say may be done. The instruments are in good condition and kept very clean. We saw a quadrant with a radius of six feet, and two divisions, to make the exactness of the observation more certain. This instrument, with many others, is placed upon marble pillars. The largest telescope is twelve Danish feet in length; it magnifies the object eight hundred times, and the farthest point of view to be seen from the Observatory is eight miles. This establishment was commenced in 1780, and all the instruments are made by Alh, at Copenhagen.—*The Casket*, No. 20.

THE SIAMESE YOUTHS.

THE lads known under the above title are two distinct twins, born about the year 1811, enjoying all the faculties and powers usually possessed by separate individuals, although united together by a short cartilaginous band, at the pit of the stomach. They were first discovered on the banks of the Siam River, by an American, Mr. Robert Hunter, by whom they were taken to New York, where they were objects of great curiosity, and were inspected by many scientific gentlemen. They were afterwards consigned to the care of Captain Coffin, by whom they were brought to England, and publicly exhibited. On first seeing them, it may be supposed, so closely are their sides together, or rather they overlap a little—that there is no interval between them. On examining them, however, they are found not to touch each other; the band which connects them being at its shortest part, which is the upper and back part, about two inches long. It grows from the lower and centre part of the breast of each boy, being a continuation of the cartilaginous termination of the ster-

num, or breast-bone, accompanied by muscles and blood-vessels, and enveloped, like every other portion of the body, with skin, &c., or what are called the common integuments. From the nature of the band, and the manner in which it grows from each boy, it is impossible that they should be in any other position in relation to each other than side by side, like soldiers, or coming up a little to the front of each other. Their arms and legs are perfectly free to move. There is no connexion between them but this band, and their proximity seems in no way to inconvenience either. Each of them, whether standing, sitting or moving, generally has his arm round the neck or waist of the other; and when this is the case, you observe that they are perfectly well formed and straight. When they take the arm from this position, so close are they kept together, that their shoulders cannot be held straight; and the near shoulder of each being obliged to be held down or up to allow them room to stand, gives them the appearance of being deformed; but two straighter or more flexible bodies can scarcely be seen. In their ordinary motions they resemble two persons waltzing more than any thing else we know of. In a room they seem to roll about as it were, but when they walk to any distance they proceed straight forward, with a gait like other people. It has been stated that they never speak to each other, but this is a mistake; though as they appear to have a means of communication more rapid than by words, we cannot be surprised that they do not use their tongues as readily as accomplished ladies. They constitute, we believe, the most remarkable specimen ever yet known, of two human bodies, perfect in all their parts, having all the animal functions separate and distinct; all the powers of locomotion, and all the faculties of each belonging to himself; in short, of two separate persons united and bound together by an inseparable link. As a proof of their intelligence,

it was stated that in a few days they learned to play at draughts well enough to become antagonists of those who had long been versed in the game. The perceptions of one, however, are more acute than those of the other; and there is a corresponding coincidence in moral qualities. He who appears most intelligent is somewhat irritable in temper; while the disposition of the other is extremely mild.

After being exhibited for several years in the metropolis and provinces of this country, the Siamese Twins returned to the place of their nativity.—*The Casket*, No. 178.

THE PYRAMIDS OF EGYPT.

THE Pyramids of Egypt, according to Dr. Pococke and Sonnini, "So celebrated from remote antiquity, are the most illustrious monuments of art. It is singular that such superb piles are no where to be found but in Egypt; for in every other country, pyramids are rather puerile and diminutive imitations of those in Egypt, than attempts at appropriate magnificence. The pyramids are situated on a rock at the foot of some high mountains which bound the Nile. Unquestionably they were all intended as places of sepulture; but their architecture, as well externally as internally, is extremely different, whether we regard the distribution, materials, or grandeur. Some are open, others close, and all have sustained some damage from the lapse of time. However, considering the astonishing number of ages that must have passed away since their creation, it is rather matter of surprise, that they should be so perfect as they are, than that they should be partially injured. They are certainly the work of the remotest antiquity: the very epoch of their foundations was lost at the time when the first Greek philosophers travelled into Egypt.

"The principal pyramids are situated about three

hours' sail up the Nile, near the place where the ancient Memphis stood. The four most remarkable fabrics of this kind are nearly on the diagonal line, and about four hundred paces from each other. The four faces exactly correspond to the four cardinal points. The two most northern are the largest, and their perpendicular height has been calculated at 500 feet. The bottom of the first is exactly 693 feet each way (that is square) and therefore covers more than eleven acres of land. The inclined plane is equal to the base, and the angles and the base form an equilateral triangle. The number of steps have been variously computed; but they are between 207 and 212: these steps, or layers, are from two and a half to four feet high, and are broad in proportion to their height. The other two pyramids are much less in magnitude, but they have some peculiarities deserving notice. It appears that the rock at the foot of the mountain has been smoothed with a chisel, and that this rocky plain is about eighty feet perpendicular above the level of the ground overflowed with the Nile. Yet in this space we find a number of shells and petrified oysters among the sands which cover the rocks, and in this quarter too, are picked up those beautiful flint stones which, on account of the singularity of their colours, are more esteemed than agate for snuff boxes and the handles of knives.

"The most northern of these pyramids is the only one that is open. The external part is constructed of great square stones cut out of the rock which extends along the Nile, where the quarries are still visible from which they have been taken. The size of these stones are unequal, but they have all the figure of a prism, that they may lie close together. It might be imagined that each range would form an even step round the pyramid; but this is not the case, and hence the reason that different travellers disagree about the number of the courses. It seems that regularity was no farther attended to than was ne-

cessary to the pyramidial form, and for the facility of the work. The external layers have neither mortar nor cramps; but in the body of the pyramid, a kind of cement is used, composed of lime, earth and clay. The only foundation is the surface of the rock, as may be plainly perceived at the four corners.

"The wind has casually and in length of time blown up a ridge of sand, which affords a commodious ascent to the entrance of the pyramid, which is forty-eight feet from the ground. On reaching this entrance, it is usual to discharge a pistol to frighten away the bats; after which, two Arab guides, whom it is necessary to engage, enter and remove the sand, with which the passage is almost stopped up.

"This being done, you strip to the shirt, on account of the excessive heat constantly felt in the pyramids, and in this condition proceed, each with a wax candle in his hand. Being arrived at the extremity of the gallery where the passage is forced, you find an opening barely sufficient to crawl through. Having passed this strait, which is about six feet long, you come to a large apartment, where it is common to take some refreshments, that you may have more strength and resolution to penetrate into the second gallery. Almost all the passages are three feet and a half square, and lined with white marble, highly polished, which, with the declivity of the way, would render it impassable, were it not for little holes cut for resting the feet in. By observing these holes, you proceed without danger to the end of the second passage, where there is a resting place, and on the right hand, an opening into a kind of well, without any steps, and which is, in fact, a perpendicular pipe, tenanted only by bats. Here the third gallery commences, leading to the inferior chamber in a horizontal direction. Before the chamber are seen stones which interrupt the way; but, having passed them, you enter the chamber, which has a sharp pointed vault, and wholly cased with granite (a reddish hard

stone, chiefly silex and felspar) once polished, but now tarnished with the smoke of the torches used in visiting it.

"Having visited the lower chamber, you return to the resting place, and ascend the fourth gallery, at the extremity of which is a little platform. Here you must commence climbing again: but having proceeded a little way, you soon find a new opening, where you may stand upright. At length by stooping for the last time, you pass the remainder of the fifth gallery, which conducts, in a horizontal line, to the upper chamber. This, like the former, is cased with granite. on the left side is a coffin of the same material, in the figure of a parallelopiped quite plain. On being struck with a key it sounds like a bell. Near this coffin is a very deep hole, which probably leads to a cavity underneath. In this chamber, also, are two narrow passages, almost filled up with the stones which the curious have thrown in to ascertain their depth. A pistol fired in this room make a report like thunder. Having reached the top, you are amused with the names of many people of different nations who have visited this pyramid; and enjoy the prospect of the surrounding country, which is truly delightful.

"The second pyramid is so well closed, that not any trace remains of its ever being opened, and its summit is coated in such a manner with polished granite, that the most intrepid would not attempt to scale it. The third is 100 feet lower than the other two, and closed in the same manner, but is destitute of coating. The fourth is 100 feet lower than the third; it is likewise closed and without coating. Its chief singularity is, that its summit is terminated by a single large stone. Round these pyramids are a number of smaller ones. About ten miles from these pyramids there are about twenty more of different sizes. One of them, called the Great Pyramid of the North, is 710 feet on the north side at the base, and

690 on the east; its height is 345 feet, therefore it covers more ground than the first that is described; but is not so high."

THE RHINOCEROS.

NEXT to the elephant, the rhinoceros is the most powerful of animals. It is usually found twelve feet long, from the tip of the nose to the insertion of the tail; from six to seven feet high; and the circumference of its body is nearly equal to its length. It is, therefore, equal to the elephant in bulk: and if it appears much smaller to the eye, the reason is, that its legs are much shorter. Words can convey but a very confused idea of this animal's shape; and yet there are few so remarkably formed: its head is furnished with a horn, growing from the snout, sometimes three feet and a half long; and but for this, that part would have the appearance of the head of a hog; the upper lip, however, is much longer in proportion, ends in a point, is very pliable, serves to collect its food, and deliver it into the mouth; the ears are large, erect, and pointed; the eyes are small and piercing; the skin is naked, rough, knotty, and lying upon the body in folds, after a very peculiar fashion: there are two folds very remarkable; one above the shoulders, and another over the rump: the skin, which is of a dirty brown colour, is so thick as to turn the edge of a scimitar, and to resist a musket-ball: the belly hangs low; the legs are short, strong, and thick, and the hoofs divided into three parts, each pointing forward.

Such is the general outline of an animal that appears chiefly formidable from the horn growing from the snout; and formed rather for war, than with a propensity to engage. This horn is sometimes found from three to three feet and a half long, growing from the solid bone, and so disposed as to be mana-

ged to the greatest advantage. It is composed of the most solid substance; and pointed so as to inflict the most fatal wounds. The elephant, the boar, or the buffalo, are obliged to strike transversely with their weapons, but the rhinoceros employs all his force with every blow: so that the tiger will more willingly attack any other animal of the forest, than one whose strength is so justly employed. Indeed, there is no force which this terrible animal has to apprehend: defended, on every side, by a thick, horny hide, which the claws of the lion or the tiger are unable to pierce, and armed before with a weapon that even the elephant does not choose to oppose. The missionaries assure us that the elephant is often found dead in the forests, pierced with the horn of a rhinoceros; and though it looks like wisdom to doubt whatever they tell us, yet I cannot help giving credit to what they relate on this occasion, particularly when confirmed by Pliny. The combat between these two, the most formidable animals of the forest, must be very dreadful. Emanuel, king of Portugal, willing to try their strength, actually opposed them to each other; and the elephant was defeated.

But though the rhinoceros is thus formidable by nature, yet imagination has not failed to exert itself in adding to its terrors. The scent is said to be most exquisite; and it is affirmed that it consorts with the tiger. It is reported also, that when it has overturned a man, or any other animal, it continues to lick the flesh quite from the bone with its tongue, which is said to be extremely rough. All this, however, is fabulous: the scent, if we may judge from the expansion of the olfactory nerves, is not greater than that of the hog, which we know to be indifferent; it keeps company with the tiger, only because they both frequent watery places in the burning climates where they are bred; and as to its rough tongue, that is so far from the truth, that no animal

of near its size has so soft a one. "I have often felt it myself," says Ladvocat, in his description of this animal; "it is smooth, soft, and small, like that of a dog; and to the feel it appears as if one passed the hand over velvet; I have often seen it lick a young man's face who kept it, and both seemed pleased with the action."

The rhinoceros which was shown at London in 1739, and described by Doctor Parsons, had been sent from Bengal. Though it was very young, not being above two years old, yet the charge of his carriage and food from India cost near a thousand pounds. It was fed with rice, sugar, and hay: it was daily supplied with seven pounds of rice, mixed with three of sugar, divided into three portions; it was given great quantities of hay and grass, which it chiefly preferred; its drink was water, which it took in great quantities. It was of a gentle disposition, and permitted itself to be touched and handled by all visitors, never attempting mischief except when abused, or when hungry; in such cases, there was no method of appeasing its fury but by giving it something to eat. When angry, it would jump up against the walls of its room with great violence, and make many efforts to escape, but seldom attemped to attack its keeper, and was always submissive to his threats. It had a peculiar cry, somewhat a mixture between the grunting of a hog and the bellowing of a calf.

The age of these animals is not well known; it is said by some that they bring forth at three years old, and if we may reason from analogy, it is probable they seldom live till above twenty. That which was shown in London was said by its keeper to be eighteen years old, and even at that age he pretended to consider it as a young one; however, it died shortly after, and that probably in the course of nature.

The rhinoceros is a native of the deserts of Asia and Africa, and is usually found in those extensive

forests that are frequented by the elephant and the lion. As it subsists entirely upon vegetable food, it is peaceful and harmless among its fellows of the brute creation; but though it never provokes to combat, it equally disdains to fly. It is every way fitted for war, but rests content in the consciousness of its security. It is particularly fond of prickly branches of trees, and is seen to feed upon such thorny shrubs as would be dangerous to other animals either to gather or to swallow. The prickly points of these, however, may only serve to give a poignant relish to this animal's palate, and may serve the same grateful ends in seasoning its banquet, that spices do in heightening ours.

In some parts of Asia, where the natives are more desirous of appearing warlike than shewing themselves brave, these animals are tamed, and led into the field to strike terror into the enemy: but they are always an unmanageable and restive animal, and probably more dangerous to the employers than those whom they are brought to oppose.

The method of taking them is chiefly by watching them, till they are found either in some moist or marshy place, where, like hogs, they are fond of sleeping and wallowing. Then they destroy the old one with fire-arms; for no weapons that are thrown by the force of man are capable of entering this animal's hide. If, when the old one is destroyed, there happens to be a cub, they seize and tame it. These animals are sometimes taken in pit-falls, covered with green branches, laid in those paths which the rhinoceros makes in going from the forest to the river sides.

There are some varieties in this animal, as in most others; some of them are found in Africa with a double horn, one growing above the other. This weapon, if considered in itself, is one of the strongest and most dangerous, that nature furnishes to any part of the animal creation. The horn is entirely

solid, formed of the hardest bony substance, growing from the upper maxillary bone, by so strong an apophyse, as seemingly to make but one part with it. Many are the medicinal virtues that are ascribed to this horn when taken in powder; but these qualities have been attributed to it without any real foundation, and make only a small part of the many fables which this extraordinary animal has given rise to

THE COLOSSUS OF RHODES.

THIS extraordinary effort of human genius was made of brass, by Chares, a native of Rhodes, to the honour of Apollo (or the sun) 290 years before Christ. He was twelve years in finishing it. This Colossus was 123 feet in height, and proportionably large in every part. It stood across the mouth of the haven of Rhodes, and was sufficiently high to admit ships to sail in and out between its legs. Few men could fathom its thumb; its head represented a golden sun.

The basis that supported it was a triangular figure; its extremities were supported by sixty pillars of marble. There was a winding staircase to go up to the top of it, whence Syria and the ships bound to Egypt could be perceived in a great looking-glass, which was suspended to the neck of the statue. In one hand it held a light house, and in the other a sceptre. It weighed 720,000lbs. avoirdupois, and is said to have cost £44,000: it was sold after lying on the ground 894 years, by the Saracens in A.D. 667, as old brass to a Jew, who loaded 900 camels with it. On the spot where the feet stood, a castle now stands on one side, and a tower on the other. Pliny mentions 100 other colossal statues in Rhodes, but none of such dimensions as the above.

DESCRIPTION OF A MONSTROUS SHEEP,

Exhibited to the Royal Society by Dr. Parsons.

THIS animal was bred in Devonshire, with a preternatural horn appearing at its birth, and reaching from the middle of the forehead to the ground. The horn, at the time of its death, was in length 2 feet 7 inches, and weighed 15 pounds. This sheep had no horns in the natural places, but only two horned stumps, projecting no more than as if half a walnut-shell was laid on a flat surface. It was stated by the man who stuffed the skin, that, upon opening the animal, there was found in the top of the horn, which was hollow half way down, a skull of a contracted round form, with numerous blood-vessels running upon it, and a bag filled with blood; among which was a substance resembling the liver and lungs of a sheep, and a perfect sound kidney-like body, similar to that found in a loin of mutton.

ENORMOUS TURTLES.

IN the Gentleman's Magazine for 1753, is the following.—'Friday, Aug. 31, a turtle, weighing 350 pounds, was eat at the King's Arms Tavern, Pall Mall; the mouth of an oven was taken down to admit the part to be baked.' Again, in the same work for the same year:—'Saturday, Sept. 29, the turtler, Capt. Crayton, lately arrived from the Island of Ascension, has brought in several turtles of above 300 pounds' weight, which have been sold at a very high price. It may be noted, that that which is common in the West Indies is a luxury here.' And once more, in the same publication for 1754, we read, 'Saturday, July 13, the Right Hon. the Lord Anson made a present to the gentlemen of White's Chocolate House, of a turtle, which weighed 300 pounds' weight, and which

had laid five eggs since, in their possession. Its shell was four feet three inches long, and about three feet wide. When its head was cut off, at least five gallons of blood issued from it, and so full was it of life, that the mouth opened and shut for an hour after it was cut off.

THE TEMPLE OF DIANA AT EPHESUS.

THE principal ornament of Ephesus was the celebrated Temple of Diana. It was built at the foot of a mountain, and head of a marsh; which situation was chosen, according to Pliny, because less subject to earthquakes. Two hundred (some say four hundred) years were spent in building this magnificent temple. It was 405 feet in length, and 200 in breadth, supported by 117 pillars, seventy feet in height, of which twenty-seven of them were curiously carved; and the rest highly polished. It was set on fire and burned down by Herostatus, who confessed on the rack that his only motive for it was to perpetuate his name: this transaction happened on the day on which Alexander the Great was born, and 356 years before the birth of Christ.

Ephesus lies on the coast of the Archipelago, fifty miles S. of Smyrna; it was formerly the capital of a considerable part of Asia.

THE WALLS OF BABYLON.

THE city of Babylon, so famous in ancient history, is now crumbled to dust, so that its site is not precisely known. We are informed by scripture that it was seated on the Euphrates; and as numerous heaps of rubbish and bricks are seen by travellers, in about lat. 32° N. and long. 39° E. it is supposed to have stood in that situation.

Babylon was sixty miles in circumference, surrounded with a wet ditch and a wall built of large bricks cemented with bitumen, a pitchy substance, which issues out of the earth in that country. Pliny says the walls were 200 feet in height, and fifty feet broad, and adds that each foot was three inches more than the Roman foot, making the foot here used equal to about 14.6 inches English. The walls were defended by 250 towers. It had 100 gates, all of solid brass, twenty-five on each side, being built in the form of a square; streets at right angles passed from each gate to its opposite, dividing the city into 625 squares. The Euphrates flowed through the middle of the city from N. to S. over which there was a bridge 1100 yards long and thirty feet wide; on each end of the bridge was a palace, the largest of which was seven miles and a half in circumference; these palaces communicated with each other by a vault built under the channel of the river. Strabo differs from the above in his description of Babylon.

Pliny says that this city was built by Semiramis, who was Queen of Assyria, 2007 years before Christ, Eusebius makes it to have been founded by Nimrod. It became the capital of the Babylonish empire under Nabonassar, 747 before Christ, and in the time of Jotham, king of Judah.

NINEVEH, according to Diodorus, was sixty miles in circuit, the walls 100 feet high, and so broad that three chariots could go abreast on them: they were defended by 1500 towers, 200 feet high. This city was situated on the Tigris. See Jonah, chap. iii.

LIVING ANIMALS FOUND INCLOSED IN SOLID BODIES.

IN 1683, M. Blondel reported to the French Academy, that at Toulon, Oysters good to eat, were frequently found in pieces of stone.

In 1685, M. de Cassini mentions a similar fact, from the testimony of M. Duraffe, ambassador at the court of Constantinople, who assured him that stones were frequently found there, in which were inclosed little animals called *dactyles*.

The following instances are not less curious, and are more recent:—

Some workmen in a quarry at Boursire, in Gotha, having detached a large piece of stone from the mass, found, on breaking it, a live Toad. They were desirous of separating the part that bore the shape of the animal, but it crumbled into sand. The toad was of a dark gray, its back a little speckled; the colour of its belly was brighter; its eyes, small and circular, emitted fire from beneath a tender membrane which covered them; they were of the colour of pale gold; when touched on the head with a stick, it closed its eyes, as if asleep, and gradually opened them again when the stick was taken away. It was incapable of any other motion. The aperture of the mouth was closed by means of a yellowish membrane. Upon pressing it on the back, it discharged some clear water, and died. Under the membrane which covered the mouth, were found, both in the upper and lower jaw, two sharp teeth, which were stained with a little blood. How long it had been inclosed in this stone, is a question that cannot be solved.

M. Le Prince, a celebrated sculptor, asserts in like manner, that he saw, in 1756, in the house of M. de la Riviere, at Ecretteville, a living Toad in the centre of a hard stone, with which it was as it were incrusted; and facts of this kind are less rare than may be imagined.

In 1764, some workmen in a quarry in Lorrain, informed M. Grignon, that they had found a Toad in a mass of stone forty-five feet below the surface of the earth. This celebrated naturalist went immediately to the spot, and could not perceive any vestige of the prison of this animal. A small cavity was visible in

the stone, and it bore no impression of the body of the Toad. The Toad that was shown him was of a middling size, of a gray colour, and seemed to be in its natural state. The workmen informed M. Grignon, that this was the sixth that had been found in these mines within the space of 30 years. M. Grignon considered the circumstance as worthy a more particular attention, and he promised therefore a reward to any person that should find him another instance of a Toad so inclosed in a stone that it had no means of getting out.

In 1770, a Toad was brought to him inclosed in two hollow shells of stone, in which it was said to have been found; but, on examining it nicely, M. Grignon perceived that the cavity bore the impression of a shell-fish, and of consequence he concluded it to be apocryphal. In 1771, however, another instance occurred, and was the subject of a curious memoir read by M. Guettard to the Royal Academy of Sciences at Paris. It was thus related by that famous naturalist:—

In pulling down a wall, which was known to have existed upwards of 100 years, a Toad was found, without the smallest aperture being discoverable by which it could have entered. Upon inspecting the animal, it was apparent that it had been dead but a very little time.

In the trunk of an elm, about the size of a man's body, three or four feet above the root, and precisely in the centre, was found, in 1719, a live Toad, of a moderate size, thin, and which occupied but a very small space. As soon as the wood was cut, it came out, and skipped away very alertly. No tree could be more sound. No place could be discovered through which it was possible for the animal to have penetrated: which led the recorder of the fact to suppose, that the spawn from which it originated, must by some unaccountable accident have been in the tree from the very first moment of its vegetation. The

Toad had lived in the tree without air; and, what is still more surprising, had subsisted on the substance of the wood, and had grown in proportion as the tree had grown. This fact was attested by M. Hebert, Ancient Professor of Philosophy at Caen.

In 1731, M. Seigne wrote to the Academy of Sciences at Paris, an account of a phenomenon similar to the preceding one, except that the tree was larger, and was an oak instead of an elm, which makes the instance more surprising. From the size of the oak, M. Seigne judged that the Toad must have existed in it, without air or any external nourishment, for the space of eighty or one hundred years.

We cite a third instance, related in a letter of the 5th of February, 1780, written from the neighbourhood of Saint Mexent, of which the following is a copy:—

'A few days ago I ordered an oak-tree of a tolerable size to be cut down, and converted into a beam that was wanted for a building which I was then constructing. Having separated the head from the trunk, three men were employed in squaring it to the proper size. About four inches were to be cut away on each side. I was present during the transaction. Conceive what was my astonishment, when I saw them throw aside their tools, start back from the tree, and fix their eyes on the same point with a kind of amazement and terror! I instantly approached and looked at the part of the tree which had fixed their attention. My surprise equalled theirs, on seeing a Toad, about the size of a large pullet's egg, incrusted in a manner in the tree, at the distance of four inches from the diameter, and fifteen from the root. It was cut and mangled by the axe, but it still moved. I drew it with difficulty from its abode, or rather prison, which it filled so completely, that it seemed to have been compressed. I placed it on the grass: it appeared old, thin, languishing, decrepid. We afterwards examined the tree with the nicest care, to discover how

it had glided in; but the tree was perfectly whole and sound.

These facts, but particularly the memoir of M. Guettard, induced M. Herissan to make experiments, calculated to ascertain their certainty. February 21, 1771, he inclosed three live toads in so many cases of plaster, and shut them up in a deal box, which he also covered with a thick plaster. On the 8th of April, 1774, having taken away the plaster, he opened the box, and found the cases whole, and two of the toads alive.—The one that died was larger than the others, and had been more compressed in its case. A careful examination of this experiment convinced those who had witnessed it, that the animals were so inclosed that they could have no possible communication with the external air, and that they must have existed during this lapse of time, without the smallest nourishment.

The Academy prevailed on M. Herissan to repeat the experiment. He inclosed again the two surviving toads, and placed the box in the hands of the secretary, that the society might open it whenever they should think proper: but this celebrated naturalist was too strongly interested in the subject to be satisfied with a single experiment; he made, therefore, the two following:—

1. He placed, 15th April, in the same year, two live toads in a basin of plaster, which he covered with a glass case, that he might observe them frequently. On the 9th of the following month, he presented this apparatus to the Academy. One of the toads was still living; the other had died on the preceding night.—2. The same day, 15th April, he inclosed another toad in a glass bottle, which he buried in sand, that it might have no communication with the external air. This animal, which he presented to the Academy at the same time, was perfectly well, and even croaked whenever the bottle was shook in which it was confined.

We beg leave to observe upon this subject, that the power which these animals appear to possess, of supporting abstinence for so long a time, may result from a very slow digestion, and perhaps from the singular nourishment which they derive from themselves. M. Grignon observes, that this animal sheds its skin several times in the course of a year, and that it always swallows it. He has known, he says, a large toad shed its skin six times in one winter.

Toads are not the only animals which have the privilege of living for a considerable period, without nourishment and communication with the external air.

Two living Worms were found in Spain, in the middle of a block of marble, which a sculptor was carving into a lion, of the natural colour, for the royal family. These worms occupied two small cavities, to which there was no inlet that could possibly admit the air. They subsisted probably on the substance of the marble, as they were of the same colour. This fact is verified by Captain Ulloa, a famous Spaniard who accompanied the French Academicians on their voyage to Peru, to ascertain the figure of the earth. He asserts, that he saw these two worms.

A Beetle, of the species called Capricorn, was found in a piece of wood in the hold of a ship at Plymouth. The wood had no external mark of any aperture.

We read in the 'Affiches de Provence,' 17th June, 1772, that an Adder was found alive in the centre of a block of marble 30 feet in diameter. It was folded nine times round in a spiral line; it was incapable of supporting the air, and died a few minutes afterwards. Upon examining the stone, not the smallest trace was to be found, by which it could have glided in, or received air.

M. Peyssonel, King's Physician at Guadaloupe, having ordered a pit to be dug in the back part of his house, live frogs were found by the workmen in beds

of petrifaction. M. Peyssonel, suspecting some deceit, descended into the pit, dug the bed of rock and petrifactions, and drew out himself, green frogs, which were alive, and perfectly similar to what we see every day.

THE TOWER OF PHAROS.

For the convenience of trade, there was built near Alexandria in Egypt, (in an island called Pharos) a tower which bore the same name. At the top of this tower was kept a fire, as a guide to such ships as sailed by night near these dangerous coasts, which were full of sands and shelves; hence light-towers have been denominated pharos, as Pharo di Messina, &c. The famous architect Sostrates built it by order of Ptolemy Philadelphus, who expended eight hundred talents upon it. The inscription on it was "Sostrates the Cnidian, son of Dexiphanes, to the protecting deities, for the use of sea-faring people."

It is impossible to determine the expense of this tower in English money by the above statement, talents being a weight and coin, some of silver and others of gold, and also the greater and lesser talent, besides their degrees of purity. Budæus, in his learned treatise *de asse*, sufficiently proves this difficulty. Dr. Arbuthnot, in his Computations, says the Alexandrian talent was equal to 91lb. Troy; supposing a pound to be worth in silver, £3, then eight hundred talents would come to £218,400 sterling; a vast sum in those days. Ptolemy Philadelphus began to reign 284 before Christ; he was the most celebrated of all the twelve Ptolemies (who swayed the Egyptian sceptre) on account of his having the Bible translated from the Hebrew into the Greek, called the Septuagint.

THE THAMES TUNNEL.

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THE nineteenth century has been productive of more novelty in science, than any preceding one. It is true that many of the projects, now completed, were in embryo for *lengthened periods*, for the want of enterprise and capital necessary for carrying on such stupendous and magnificent schemes. We shall pass over the many conjectures hazarded by the money lover, and come at once to the most curious, and, at the same time, the most necessary undertaking, in allusion to our commercial views and connections.

So far back as the year 1799 a project was set on foot for the purpose of constructing a tunnel at Gravesend; but the plan was not patronised, and, consequently, fell to the ground. In 1823 Mr. Brunel, the celebrated civil engineer, exhibited *his* plan for constructing a *double* capacious road-way under the Thames. He selected a spot between Rotherhithe on the Surrey side, and Wapping on the Middlesex shore; and this selection evinced considerable judgment, as it did not interfere with the mercantile pursuits of the neighbourhood; and it also *possessed* a stratum of blue clay peculiarly adapted to the purpose. As soon as an Act of Parliament could be obtained, Mr. Brunel commenced his labours by sinking a shaft 50 feet in diameter on the Surrey side, and passed through a bed of gravel and sand 26 feet deep, constituting a kind of quicksand in which the drift makers of a former undertaking had been compelled to abandon their work. Mr. Brunel had been warned of this;—he therefore sunk the shaft deeper, and formed a lesser one of 25 feet diameter, a kind of well for drainage; but, on approaching the depth of 80 feet, the ground gave way suddenly under the small shaft, which sunk several feet at once, the sand and water blowing up at the same time. The necessary repairs consequent

upon this interruption having been completed, the horizontal excavation for the body of the tunnel was commenced at the depth of 63 feet, with a declivity of 2 feet 3 inches in every one hundred feet. The excavation is 38 feet in breadth, and 22 feet 6 inches in height, presenting a sectional area of 15 feet. The basis of this excavation, in the deepest part of the river, is 76 feet below high water mark.

It is by means of a powerful apparatus, which has been designated a "*shield*," that this extensive excavation has been effected, and that the double roadway and paths have at the same time been constructed within it. This shield consists of twelve great frames, standing close to each other, like as many volumes on the shelf of a book-case: these frames are 22 feet in height, and about 3 feet in breadth. They are divided into three stages or stories, thus presenting 36 chambers, or cells for the workmen—namely, the miners, by whom the ground is cut down and secured in front; and the bricklayers, by whom the structure is simultaneously formed.

On two several occasions the river broke in upon the workmen, and consequently suspended their labours for a considerable period. The last time of this irruption, the injury was repaired by filling bags with clay and throwing them into the Thames immediately over the chasm made in the bed of the river. This simple remedy seems to have had the desired effect, and the work has progressed satisfactorily and rapidly. The tunnel has advanced 810 feet in length, and only requires a still further advance of 110 feet to reach low water mark on the Middlesex shore. The entire length when completed will be 1300 feet. This stupendous undertaking is open to public inspection, at a trifling charge. The effect produced by the gas lights, with which it is plentifully supplied, is of the most extraordinary and splendid nature. The cost of this *eighth* wonder of the world is about £1000 a foot; and, before it is entirely

completed, the enormous sum of £800,000 will have been expended. The utility of the undertaking is such that it will connect the counties of Middlesex and Surrey so closely that the cause of commerce must be considerably enchanced at this particular part, as it would be impossible to erect a bridge over that part of the river, for an immese number of colliers and coasting vessels continually pass and repass.

This does not appear to be the *only* construction of the sort in the world, for we find that a sub-marine bridge, like the tunnel, was completed by order of Semiramis, who caused to be constructed a bridge under the *Euphrates*, in order to be able to repair, secretly, from one to the other of the two palaces which were built upon each bank of that river. This road was 300 stadia in length, 19 in breadth, 12 in height, and was finished in 260 days!

THE TOMB OF MAUSOLEUS.

THE tomb of Mausoleus was built by his wife Artemisia in honour and respect to her husband, king of Caria, a country of Asia Minor. This tomb was so superb and curious in its architecture, as to be considered one of the Seven Wonders of the World; hence every grand tomb has since been termed a mausoleum. This celebrated tomb was executed by four architects, Scopas, Leochares, Timotheus, and Brixis, about 356 years before Christ. Its length was sixty-three feet from north to south, and nearly the same in breadth, being encompassed by thirty-six noble columns.

After the death of Queen Artemisia, Pytheus raised a building in the middle of the tomb, formed like a pyramid, and placed on its summit a car of marble, to which was harnessed four horses of the same material.

THE HANGING GARDENS OF BABYLON.

THESE gardens were of a square form, each being 400 feet in length; they were carried in the manner of large terraces, one above another, till they rose as high as the walls of the city, the ascent being from terrace to terrace, by stairs ten feet wide. The whole pile was sustained by vast arches raised on other arches, and strengthened by a wall surrounding it of twenty-two feet thick. On the top of these arches were laid large flat stones, sixteen feet long and four broad; these were lined with brick, closely cemented together with plaster of bitumen, and that covered with sheets of lead, upon which lay the mould of the garden, where there were large trees, shrubs, and flowers, with various sorts of vegetables.

There were five of these gardens, each containing about four English acres, and disposed in the form of an amphitheatre.—*Strabo, Diodorus, &c.*

THE OSTRICH.

IN beginning with the feathered tribe, the first animal that offers seems to unite the class of quadrupeds and birds in itself. While it has the general outline and properties of a bird, yet it retains many of the marks of the quadruped. In appearance the ostrich resembles the camel, and is almost as tall; it is covered with a plumage that resembles hair much more nearly than feathers, and its internal parts bear as near a similitude to those of the quadruped as of the bird creation. It may be considered, therefore, as an animal made to fill up that chasm in nature which separates one class of beings from another.

The ostrich is the largest of all birds. Travellers affirm that they are seen as tall as a man on horseback; and even some of those that have been brought into England were above seven feet high. The head

and bill somewhat resemble those of a duck: and the neck may be likened to that of a swan, but that it is much longer; the legs and thighs resemble those of a hen; though the whole appearance bears a strong resemblance to that of a camel. But to be more particular; it is usually seven feet high from the top of the head to the ground; but from the back it is only four; so that the head and neck are above three feet long. From the top of the head to the rump, when the neck is stretched out in a right line, it is six feet long, and the tail is about a foot more. One of the wings without the feathers, is a foot and a half; and being stretched out, with the feathers, is three feet.

The plumage is much alike in all; that is, generally black and white; though some of them are said to be gray. The greatest feathers are at the extremities of the wings and tail, and the largest are generally white. The next row is black and white; and of the small feathers on the back and belly, some are white and others black. There are no feathers on the sides, nor yet on the thighs, nor under the wings. The lower part of the neck, about half way, is covered with still smaller feathers than those on the belly and back: and those, like the former, also are of different colours.

All these feathers are of the same kind, and peculiar to the ostrich; for other birds have several sorts, some of which are soft and downy, and others hard and strong. Ostrich feathers are almost all as soft as down, being utterly unfit to serve the animal for flying, and still less adapted to be a proper defence against external injury. The feathers of other birds have the webs broader on one side than the other, but those of the ostrich have their shaft exactly in the middle. The upper part of the head and neck are covered with a very fine, clear, white hair, that shines like the bristles of a hog; and in some places there are small tufts of it, consisting of above twelve

hairs, which grow from a single shaft about the thickness of a pin.

At the end of each wing there is a kind of spur, almost like the quill of a porcupine. It is an inch long, being hollow and of a horny substance. There are two of these on each wing; the largest of which is at the extremity of the bone of the wing, and the other a foot lower. The neck seems to be more slender in proportion to that of other birds, from its not being furnished with feathers. The skin in this part is of a livid flesh colour, which some improperly would have to be blue. The bill is short and pointed, and two inches and a half at the beginning. The external form of the eye is like that of a man, the upper eye-lid being adorned with eye-lashes, which are longer than those on the lid below. The tongue is small, very short, and composed of cartilages, ligaments, and membranes, intermixed with fleshy fibres. In some it is about an inch long, and very thick at the bottom. In others it is but half an inch, being a little forked at the end.

The thighs are very fleshy and large, being covered with a white skin, inclining to redness, and wrinkled in the manner of a net, whose meshes will admit the end of a finger. Some have very small feathers here and there on the thighs; and others again have neither feathers nor wrinkles. What are called the legs of birds, in this are covered before with large scales. The end of the foot is cloven, and has two very large toes, which, like the leg, are covered with scales. These toes are of unequal sizes. The largest, which is on the inside, is seven inches long, including the claw, which is near three-fourths of an inch in length, and almost as broad. The other toe is but four inches long, and is without a claw.

The internal parts of this animal are formed with no less surprising peculiarity. At the top of the breast, under the skin, the fat is two inches thick; and on the fore part of the belly it is as hard as suet,

and about two inches and a half thick in some places. It has two distinct stomachs. The first, which is lowermost, in its natural situation somewhat resembles the crop in other birds; but it is considerably larger than the other stomach, and is furnished with strong muscular fibres, as well circular as longitudinal. The second stomach, or gizzard, has outwardly the shape of the stomach of a man; and, upon opening, is always found filled with a variety of discordant substances; hay, grass, barley, beans, bones, and stones, some of which exceed in size a pullet's egg. The kidneys are eight inches long, and two broad, and differ from those of other birds in not being divided into lobes. The heart and lungs are separated by a midriff, as in quadrupeds, and the parts of generation also bear a very strong resemblance and analogy.

Such is the structure of this animal, forming the shade that unites birds and quadrupeds; and from this structure its habits and manners are entirely peculiar. It is a native only of the torrid regions of Africa, and has long been celebrated by those who have had occasion to mention the animals of that region. Its flesh is proscribed in scripture as unfit to be eaten; and most of the ancient writers describe it as well known in their times. Like the race of the elephant, it is transmitted down without mixture; and has never been known to breed out of that country which first produced it. It seems formed to live among the sandy and burning deserts of the torrid zone; and, as in some measure, it owes its birth to their genial influence, so it seldom migrates into tracts more mild or more fertile. As that is the peculiar country of the elephant, the rhinoceros, and camel, so it may readily be supposed capable of affording a retreat to the ostrich. They inhabit, from preference, the most solitary and horrid deserts, where there are few vegetables to clothe the surface of the earth, and where the rain never comes to re-

fresh it. The Arabians assert that the ostrich never drinks; and the place of its habitation seems to confirm this assertion. In these formidable regions, ostriches are seen in large flocks, which, to the distant spectator, appear like a regiment of cavalry, and have often alarmed a whole caravan. There is no desert, how barren soever, but what is capable of supplying these animals with provision; they eat almost every thing; and these barren tracts are thus doubly grateful, as they afford both food and security. The ostrich is of all other animals the most voracious. It will devour leather, glass, hair, iron, stones, or anything that is given. Nor are its powers of digestion less in such things as are digestible. Those substances which the coats of the stomach cannot soften, pass whole; so that glass, stones, or iron, are excluded in the form in which they were devoured. All metals, indeed, which are swallowed by any animal, lose a part of their weight, and often the extremities of their figure, from the action of the juices of the stomach upon their surface. A quarter pistole, which was swallowed by a duck, lost seven grains of its weight in the gizzard before it was voided; and it is probable that a still greater diminution of weight would happen in the stomach of an ostrich; considered in this light, therefore, this animal may be said to digest iron; but such substances seldom remain long enough in the stomach of any animal to undergo so tedious a dissolution. However this may be, the ostrich swallows almost every thing presented to it. Whether this be from the necessity which smaller birds are under of picking up gravel to keep the coats of their stomach asunder, or whether it be from a want of distinguishing by the taste what substances are fit and what incapable of digestion, certain it is, that in the ostrich dissected by Ranby there appeared such a quantity of heterogeneous substances, that it was wonderful how any animal could digest such an overcharge of nourishment. Valisni-

eri also found the first stomach filled with a quantity of incongruous substances; grass, nuts, cords, stones, glass, brass, copper, iron, tin, lead, and wood: a piece of stone was found among the rest that weighed more than a pound. He saw one of these animals that was killed by devouring a quantity of quick-lime. It would seem that the ostrich is obliged to fill up the great capacity of its stomach in order to be at ease; but that nutritious substances not occurring, it pours in whatever offers to supply the void.

In their native deserts, however, it is probable they live chiefly upon vegetables, where they lead an inoffensive and social life; the male, as Thevenot assures us, assorting with the female with connubial fidelity. They are said to be very much inclined to venery; and the make of the parts in both sexes seems to confirm the report. It is probable, also, they copulate, like other birds, by compression; and they lay very large eggs, some of them being above five inches in diameter, and weighing above fifteen pounds. These eggs have a very hard shell, somewhat resembling those of the crocodile, except that those of the latter are less and rounder.

The season for laying depends on the climate where the animal is bred. In the northern parts of Africa, this season is about the beginning of July; in the south, it is about the latter end of December. These birds are very prolific, and lay generally from forty to fifty eggs at one clutch. It has been commonly reported that the female deposits them in the sand; and covering them up, leaves them to be hatched by the heat of the climate, and then permits the young to shift for themselves. Very little of this, however, is true; no bird has a stronger affection for her young than the ostrich, nor none watches her eggs with greater assiduity. It happens, indeed, in those hot climates that there is less necessity for the continual incubation of the female; and she more frequently leaves her eggs, which are in no fear of being chilled

by the weather; but though she sometimes forsakes them by day, she always carefully broods over them by night; and Kolben, who has seen great numbers of them at the Cape of Good Hope, affirms that they sit on their eggs like other birds, and that the male and female take this office by turns, as he had frequent opportunities of observing. Nor is it more true what is said of their forsaking their young after they are excluded the shell. On the contrary, the young ones are not even able to walk for several days after they are hatched. During this time the old ones are very assiduous in supplying them with grass; and very careful to defend them from danger; nay, they encounter every danger in their defence. It was a way of taking them among the ancients, to plant a number of sharp stakes round the ostrich's nest in her absence, upon which she pierced herself at her return. The young, when brought forth, are of an ash colour the first year, and are covered with feathers all over. But, in time, these feathers drop; and those parts which are covered assume a different and more becoming plumage.

The beauty of a part of this plumage, particularly the long feathers that compose the wings and tail, is the chief reason that man has been so active in pursuing this harmless bird to its deserts, and hunting it with no small degree of expense and labour. The ancients used these plumes in their helmets, the ladies of the East make them an ornament in their dress: and, among us, our undertakers and our fine gentlemen still make use of them to decorate their hearses and their hats. Those feathers, which are plucked from the animal while alive, are much more valued than those taken when dead; the latter being dry, light, and subject to be worm-eaten.

Besides the value of their plumage, some of the savage nations of Africa hunt them also for their flesh, which they consider as a dainty. They sometimes also breed these birds tame, to eat the young

ones, of which the female is said to be the greatest delicacy. Some nations have obtained the name of Struthophagi, or ostrich-eaters, from their peculiar fondness for this food; and even the Romans themselves were not averse to it. Apius gives us a recipe for making sauce for the ostrich; and Heliogabulus is noted for having dressed the brains of six hundred ostriches in one dish; for it was his custom never to eat but of one dish in a day, but that was an expensive one. Even among the Europeans now, the eggs of the ostrich are said to be well tasted, and extremely nourishing, but they are too scarce to be fed upon, although a single egg be a sufficient entertainment for eight men.

As the spoils of the ostrich are thus valuable, it is not to be wondered at that man has become their most assiduous pursuer. For this purpose the Arabians train up their best and fleetest horses, and hunt the ostrich still in view. Perhaps, of all other varieties of the chase, this, though the most laborious, is yet the most entertaining. As soon as the hunter comes within sight of his prey, he puts on his horse with a gentle gallop, so as to keep the ostrich still in sight; yet not so as to terrify him from the plain into the mountains. Of all known animals that make use of their legs in running, the ostrich is by far the swiftest: upon observing himself therefore pursued at a distance, he begins to run at first but gently; either insensible of his danger, or sure of escaping. In this situation he somewhat resembles a man at full speed; his wings, like two arms, keep working, with a motion corresponding to that of his legs; and his speed would very soon snatch him from the view of his pursuers; but, unfortunately for the silly creature, instead of going off in a direct line, he takes his course in circles; while the hunters still make a small course within, relieve each other, meet him at unexpected turns, and keep him thus still employed, still followed for two or

three days together. At last, spent with fatigue and famine, and finding all power of escape impossible, he endeavours to hide himself from those enemies he cannot avoid, and covers his head in the sand, or the first thicket he meets. Sometimes, however, he attempts to face his pursuers; and, though in general the most gentle animal in nature, when driven to desperation, he defends himself with his beak, his wings, and his feet. Such is the force of his motion, that a man would be utterly unable to withstand him in the shock.

The Struthophagi have another method of taking this bird; they cover themselves with an ostrich's skin, and passing up an arm through the neck, thus counterfeit all the motions of this animal. By this artifice they approach the ostrich, which becomes an easy prey. He is sometimes also taken by dogs and nets: but the most usual way is that mentioned above.

When the Arabians have thus taken an ostrich, they cut its throat, and making a ligature below the opening, they shake the bird, as one would rinse a barrel; then taking off the ligature, there runs out from the wound in the throat a considerable quantity of blood mixed with the fat of the animal; and this is considered one of the greatest dainties. They next flay the bird; and of the skin, which is strong and thick, sometimes make a kind of vest, which answers the purpose of a cuirass and a buckler.

There are others, who more compassionate or more provident, do not kill their captive, but endeavour to tame it for the purpose of supplying those feathers which are in so great request. The inhabitants of Dara and Lybia breed up whole flocks of them, and they are tamed with very little trouble. But it is not for their feathers alone that they are prized in their domestic state; they are often ridden upon and used like horses. Moore assures us that at Joar, he saw a man travelling upon an ostrich; and Adanson asserts,

that, at the factory of Podore, he had two ostriches, which were then young, the strongest of which ran swifter than the best English racer, although he carried two negroes on his back. As soon as the animal perceived that it was thus loaded, it set off running with all its force, and made several circuits round the village; till at length the people were obliged to stop it by barring up the way. How far this strength and swiftness may be useful to mankind, even in a polished state, is a matter that deserves inquiry. Posterity may avail themselves of this creature's abilities; and riding upon an ostrich may one day become the favourite, as it is most certainly the swiftest mode of conveyance.

The parts of this animal are said to be convertible to many salutary purposes in medicine. The fat is said to be emollient and relaxing; that while it relaxes the tendons, it fortifies the nervous system; and being applied to the region of the loins, it abates the pains of the stone in the kidney. The shell of the egg powdered, and given in proper quantities, is said to be useful in promoting urine, and dissolving the stone in the bladder. The substance of the egg itself is thought to be peculiarly nourishing: however, Galen, in mentioning this, asserts, that the eggs of hens and pheasants are good to be eaten, those of geese and ostriches are worst of all.—*Goldsmith's Animated Nature.*

THE TOWER OF BABEL.

BABEL was built in the plains of Shinar (Genesis xi.) and afterwards was inclosed and became a part of the city of Babylon; this presumptuous work was carried on by Nimrod, great grandson of Noah (Genesis x.) 2247 years before Christ, and is said to have been about 843 feet (being 343 feet higher than the loftiest of the Pyramids of Egypt), and its circum-

ference at the base equal to 8430 feet. These measures are, however, deserving only of a discretionary belief. Some are of opinion that this extraordinary structure was round, others that it was square. On the top were three statues of solid gold; that of Jupiter was forty feet high. Some reckon Babel among the Wonders of the World.

THE GREAT WALL OF CHINA.

Of all the works of art, this seems the greatest (even superior to the pyramids) master-piece of industry, genius, and perseverance. It was built (according to Du Halde) by the Emperor Chien-chu-Toang, 221 years before Christ. The policy of the Chinese prevents our being acquainted with this and many other interesting circumstances with which this vast and populous empire abounds.

This stupendous wall, which is from twenty to twenty-five feet high, is carried over a mountainous country on the northern borders of China for an extent of 1500 miles, and was built to prevent the incursions of the Tartars. Its breadth on the top is such that six horsemen can ride abreast upon it with convenience; and it is flanked with towers forty-eight feet high and fifty wide, at the distance of two bow-shots. At the gates the wall is in some places double, at other places there are three walls; it is quite firm and compact, notwithstanding it has stood upwards of 2000 years. It was, however, repaired in the 12th century.

AURORA BOREALIS.

The Aurora Borealis, northern lights, or, as it is vulgarly called, *streamers*, is a kind of meteor that has been observed towards the north part of the hea-

vens, seldom approaching nearer the equator than 45° N. lat. and never to it.

The aurora is very common in the N. parts of Europe. In N. Britain it is visible almost every night in winter. Its colours incline generally to a yellowish white, but sometimes intermixed with reddish streaks, and having the colours of the rainbow. Sometime about the year 1765, it overspread the whole horizon in the lat. of 57° N. in one continued fixed haze of a dismal red during the whole night, by which many people were much terrified. At other times it assumes the appearance of a sun, having its pole in the zenith, darting its beams out in all directions, extending to the horizon on every side, changing its general form and colour every instant, but frequently appears like a crown. Sometimes it runs across the north part of the horizon, a little way above it, in a fixed position; in this situation it is chiefly yellow turning to a yellowish white, softening off to the colour of the sky. In this and its other appearances it yields considerable light, so that people can walk abroad very comfortably by it.

At what time this meteor was first observed is not known; none are recorded in the English annals till the remarkable one which happened on the 30th of January, 1560; another very brilliant one appeared on the 6th of March, 1716; and during two succeeding nights, a noted one appeared in 1760; others have been noticed in 1707 and 1708. Scarcely a year passes without their being seen at London, although seldom conspicuous.

Father Boscovich has determined the height of an aurora borealis, which was observed by the Marquis of Poleni, 16th of Dec. 1737, and found it was 825 miles high; and Mr. Bergman, from a mean of 30 computations, makes the average height to be 72 Swedish miles, or (supposing a Swedish mile to be 6½ English) 468 English miles; a height, when compa-

red with Sir C. Blagden's observations on the elevation of meteors, which appears incredible.

The aurora borealis has considerable influence on the magnetic needle, and when it descends lower than usual in the atmosphere, the flatus or corruscations have been attended with various sounds of rumbling, hissing, cracking, and clapping; this has been more particularly observed in Russia, and the northern parts of America.

Various opinions have been formed relative to this phenomenon, by Dr. Halley, who attributed it to vapours and sulphureous streams, by M. de Mavin, Beccaria and Dr. Franklin, who supposed it to be produced by an accumulation of the electric fluid among the vapours in the polar regions. This opinion very generally prevailed till opposed by Mr. Dalton and M. Libes; the former very plausibly attributes it to a magnetic atmosphere which he supposes surrounds the earth; and the latter, to the decomposition of the two airs which compose the atmosphere, oxygen, and nitrogen, in the polar regions, by an accumulation of the electric fluid there. This explanation is supported by a very accurate attention to the chemical phenomenon produced on the atmosphere by electricity, which decomposes it and forms nitrous gas. The chemical appearances at the formation or disengagement of nitric acid, nitrous acid or nitrous gas, fully solve all the phenomena of reddish colour, cracking noise, &c. in the aurora borealis, except its magnetic quality, which is not yet well understood. The theory however of M. Libes is likely to prevail till farther experiments or discoveries make us better acquainted with the nature and causes of the northern lights.

LIGHT.

LIGHT is a succession of exceeding small particles of matter issuing from a luminous body, as the sun, a fire, candle, &c. These particles flow in all directions, without interrupting one another; and also in a straight line, if not bent, by passing through different mediums, as mentioned in treating of Refraction. The particles of light being so small, a great number of them are contained in a little space; Dr. Nieuwentyt (in his Religious Philosopher) computes that in one second of time there flow 418,660,000,000,000,000,000,000,000,000,000,000,000,000,000 particles of light out of a lighted candle; these particles are so minute, as not to be discernible by our best microscopes, and were they not so, instead of being serviceable to us, they would soon deprive us of sight, by the force arising from their amazing velocity, which is known to be upwards of 11,500,000 miles in a minute.

When these small particles, flowing from the sun or from a candle, fall upon bodies, and are thereby reflected to our eyes, they excite in us the idea of that body, by forming its picture on the retina.

That the rays of light flow in all directions from different bodies without interrupting one another, is plain from the following experiment. Make a little hole in a thin plate of metal, and set the plate upright on a table, facing a row of lighted candles standing near together; then place a sheet of paper or pasteboard at a little distance from the other side of the plate, and the rays of all the candles, flowing through the hole, will form as many specks of light on the paper as there are candles before the plate; each speck as distinct and large as if there were only one candle to cast one speck; which shows that the rays do not obstruct each other in their motions, although they all cross in the same hole.

Light, and heat, as far as the latter depends on the

rays of the sun, decrease in proportion to the distances of the planets from the sun, and consequently in proportion to the distance of any object from a fire or candle. For example, let A, B, C, and D, be four objects, placed near a fire or candle; let A be at two feet from it, B four feet, C six feet, and D eight feet, then the square of their respective distances is A 4, B 16, C 36, and D 64; hence A enjoys four times as much light or heat as B, nine times as much as C, and sixteen times as much as D; and, on the contrary, D has only the sixteenth part of the light or heat that A enjoys, &c. By this rule is determined the proportional quantity of light or heat that the earth, moon, or planets, have from the sun.

THE EDDYSTONE LIGHTHOUSE.

ABOUT three leagues from Plymouth Sound, between the Lizard and the place called the Star Point, lie a number of shelving rocks, exceedingly dangerous at all times, but more so when covered by the tide. The present is the third light-house that has been ereeted on the spot. The first was built of wood, in the reign of King William, by a Mr. Winstanley. It was much admired for the ingenuity of its construction; and, so well satisfied was the architect of its stability, that he would often say, he wished for nothing more than to be shut up in it during a violent storm. He had his wish; for he happened to be in it at the time of a memorable storm on the 26th of November, 1703, which swept the building into the sea, where Mr. Winstanley perished.

Another light-house was raised before the conclusion of Queen Anne's reign, by one Rudyard. This was also constructed of wood; but, by introducing 270 tons of stone as ballast, and avoiding all projections or openings on which the storms would be likely to fasten, it was thought it would escape the

fate of its predecessor. It was, however, fated to a different catastrophe. One night, in the year 1755, it was observed to be on fire. Its upper works, having been constructed of light timber, probably could not bear the heat of the lights.

The next light-house, which is the present one, was built by Mr. Smeaton, and is constructed on a plan which it is hoped will secure it against every danger. It is built entirely of stone, in a circular form. Its foundations are let into a socket in the rock, on which it stands, and of which it almost makes a part; for the stones are all united with the rock, and with each other, by massy dovetails. When the tide swells above the foundation of the building, the light-house makes the odd appearance of a structure emerging from the waves. But sometimes a wave rises above the very top of it, and, circling round, the whole looks like a column of water, till it breaks into foam, and subsides.

The care of this important beacon is committed to four men; two of whom take charge of it by turns, and are relieved every six weeks. But, as it often happens, especially in stormy weather, that boats cannot touch at the Eddystone for many months, a proper quantity of salt provision is always laid up, as in a ship victualled for a long voyage. In high winds, such a briny atmosphere surrounds this gloomy solitude, from the dashing of the waves, that a man exposed to it could not draw his breath. At these dreadful intervals the two forlorn inhabitants keep close quarters, and are obliged to live in darkness and stench; listening to the howling storm, and excluded in every emergency from the least hope of assistance.

The emolument of this arduous post is twenty pounds a year, and provisions while on duty.

THE BELL-ROCK, AND LIGHT-HOUSE.

THE Bell-Rock, in the German Ocean, formerly called the Scape, and the Inchcape, is a most dangerous reef, a sunken rock, lying at the distance of 11 miles from the promontory called the Red Head, in Forfarshire. The rock itself measures about 427 feet in length, and 200 feet in breadth, and is about 12 feet under water at the ordinary height, or perpendicular rise of spring tides. This rock is one of the most dangerous, in point of situation, that is to be met with on the coast of Great Britain; for while it lies in one of the most frequented estuaries, or friths in the kingdom, it is much lower in the water than any rock on which similar buildings have been erected; and the mariner could formerly have little or no warning of his danger when in its vicinity. The Bell-Rock was therefore long considered as the chief obstruction to the navigation of that important estuary, the Frith of Forth, and for ages, the want of some distinguishing mark to point out its place was lamented. This rock, or most dangerous reef, is noticed in the voyage of King James V. of Scotland; and tradition says, that the abbots of the ancient monastery of Aberbrothock succeeded in fixing a bell upon it in such a manner, that it was rung by the impulse of the sea, so as to warn mariners of their impending danger. Tradition says, that this apparatus was carried away by a Dutchman, who, to complete the story, was afterwards lost upon the rock, with his ship and crew.

The Bell-Rock light-house, is a circular building, measuring 42 feet in diameter at the base, and 13 feet in diameter at the top. The masonry is 100 feet in height, and including the light-room, it measures about 115 feet. The ascent from the rock to the top of the solid, or lowest, 30 feet, is by means of a kind of trap-ladder, which is ascended with great celerity by the light-keepers, but forms rather a difficult path for strangers, who are generally hoisted up to the en-

trance-door, in a chair, by a moveable crane of a singular construction, which projects from the building. The ascent from the level of the entrance-door, is by means of a circular stair to the first apartment, containing the water, fuel, &c. From thence to the several apartments, the communication is by wooden steps. The three lower apartments of the light-house have two windows each; but the upper rooms have each four windows. The windows have all double sash-frames, glazed with plate-glass, besides a storm-shutter of timber for the defence of the glass against the sprays of the sea; for although the light-room is about 88 feet above the medium level of the tide, and is defended by a projecting cornice, or balcony, with a cast-iron rail, formed like the meshes in net-work, yet the sprays of the sea occasionally lash or fall upon the glass of the light-room, so that it becomes necessary, in gales of wind, to shut the whole of the dead lights to the windward.

The light of the Bell-Rock is from oil, with Argand burners, placed on the focus of silver-plated reflectors, hollowed with a wonderful degree of accuracy, to the parabolic curve, simply by the process of hammering. These reflectors measure 24 inches over the lips; and the light is so powerful, as to be seen and readily distinguished at the distance of six or seven leagues when the atmosphere is clear.

The Bell-Rock light may easily be distinguished from all others upon the coast, as it shews the natural or common bright light alternately, with a light of a red colour, tinged by the interposition of plates of glass stained red, which are placed between the observer and the reflector. These reflectors are ranged upon a frame, with four faces or sides, two of these sides being filled up with coloured shades, while the former is made to revolve upon a perpendicular axis, by means of a train of machinery, and thereby exhibits alternately a red-coloured light, and a bright light of the natural appearance. Between these ap-

pearances, and in the course of each revolution, there are intervals of darkness, which in a very simple and beautiful manner mark out this light-house to the mariner from all others on the coast.

The same machinery is used for tolling two large bells, night and day, during the continuance of foggy weather. As these bells weigh about twelve hundred weight each, they are heard at a considerable distance, so as to alarm and give warning in thick and hazy weather to the mariner, on his approach to the rock, when the light and light-house may be hid in fog.—*Edinburgh Encyclopedia.*

ELASTIC MARBLE.

THERE is a curiosity to be seen at Rome, which seems to have escaped the notice of all travellers who have written on that city, except the Abbé Fortis, and he only speaks of it incidentally,—it is five or six tables of elastic marble, in the possession of the Prince Borghese. Being set on an end, they bend backward and forward; when laid horizontally, and raised at one end, they form a curve; if placed on a table, and a piece of wood, or any other substance, is laid under them, they fall into a kind of curve, each end touching the table. Notwithstanding their flexibility, they are liable to be broken, if indiscreetly handled.

The length of each is about two feet and a half; they are about ten inches broad, and three thick. They were dug up, as the Abbé was told, near the town of Mondragon, in the kingdom of Naples; the grain is like that of fine Carrarese marble, or, perhaps, of the finest Greek; they seem to have suffered some attack of fire; they are, perhaps, susceptible of a polish. These marble slabs are doubtless the saccharine carbonated lime of Hauy, or granular limestone, which is generally white, and found to be slightly flexible. M. Fleuvian de Belvue succeeded in mak-

ing common granular limestone, and granular quartz, completely flexible, by exposing them to a certain degree of heat.

A slab of marble, similar in every respect to those above described, and highly polished, has been exhibited for several years past at the British Museum.

THE MAMMOTH.

In the Museum of Philadelphia is a fine specimen of the Mammoth. This wonder of the animal creation was found in the spring of 1801, at Newburgh, on the Hudson or North River, in the state of New York, that part of the country abounding with morasses. It was in digging in one of these, at a depth of twelve feet, that one of the thigh-bones was found, three feet nine inches in length, and eighteen inches in width. A Mr. Peale (who had been for some time collecting the bones of the mammoth) employed a number of excavators, in the hopes of recovering the entire bones of this extraordinary animal, and for several weeks no exertions were spared; but at length the patience of the men became exhausted, and the work was relinquished. Mr. Peale, however, ordered a morass, eleven miles distant from the former, to be opened, where an entire set of ribs was found, at a depth of between four and seven feet. Mr. Peale's next place of search (about twenty miles west from the Hudson) was a dismal morass, where, after alternate success and disappointment, he found the large bone of the right leg, with the radius of the left, the right scapula, the atlas, and a complete under-jaw. The upper part of the head was found twelve feet distant. This collection, with what Mr. Peale had presented to him by Drs. Graham and Post, loaded two waggons, and formed two skeletons. One Mr. P. sold to the Museum at Philadelphia, and the other he exhibited throughout Europe. Within the breast of this

skeleton, Mr. Peale, accompanied by a dozen of his friends, partook of a superb dinner.

It is now (1832) above a hundred years ago, since the first remains of this animal were found in America.

The skeleton of the mammoth is calculated to excite the wonderment of all beholders from its extraordinary size: but to the philosopher it is infinitely more interesting, demonstrating, as it does, that in former periods this globe has been occupied by an order of animals now extinct, and, it is supposed, of dimensions far surpassing anything now in existence.

Pallas says, that from the Don to Tckutskoiness, there is scarcely a river that does not exhibit the remains of the mammoth, and that they are frequently imbedded in alluvial soil, containing marine productions. The skeletons are seldom complete; but in one instance this animal was found in an entire state, at the mouth of a river in Siberia. Bones of Mammoths have been found in the alluvial soil near London, Northampton, Gloucestershire, Harwich, Norwich, Salisbury Plain, and in other places in England; they also occur in the north of Ireland, and in Sweden, Iceland, Russia, Poland, Germany, France, Holland, and Hungary. Its teeth have also been found in North and South America, and abundantly in Asiatic Russia.

It appears, that at the end of the year 1799, a Tungusian fisherman observed a strange shapeless mass projecting from an ice-bank near the mouth of a river, in the north of Siberia. The next year he observed the same object, which was then rather more disengaged from among the ice, but he was still unable to conceive what it was. Towards the end of the next summer, he perceived it was the frozen carcase of an enormous animal, the entire flanks of which, and of its tusks, had become disengaged from the ice. In 1803, owing to the ice melting, the carcase became disengaged, and fell upon a sand-bank. Two years afterwards, it still remained where it had fallen,

but was greatly mutilated. The peasants had taken away quantities of the flesh to feed their dogs; and wild animals, particularly white bears, had feasted on it; yet the entire skeleton remained, except that one of the fore legs was gone. The entire spine, the pelvis, one shoulder-blade, and three legs, were still held together by the ligaments and by remains of the skin, and the other shoulder-blade was found near. The head, covered by the dried skin, remained, and the pupils of the eyes were still distinguishable. The brain, though much dried and shrunk, remained within the skull, and one of the ears was in excellent preservation, still retaining a tuft of strong bristly hair. The upper lip was much eaten away, and the under lip was entirely gone, so that the teeth were visible. The animal was a male, and had a long mane on its back.

The skin was extremely thick, and as much of it remained as required ten men to carry away, with great difficulty; more than 30lbs. of its hair and bristles were gathered, which were more than a foot in length, mixed with thinner bristles of coarse flexible hair, and wool of a reddish brown colour. It is evident that this enormous animal belonged to a race of mammoths inhabiting a cold region, and that it must have been frozen up at the moment of its death.

In 1817, Dr. Mitchell, of New York, announced the discovery of the remains of a Mammoth, on the preceding day, in the town of Goshen, Orange county, within 60 miles of New York, in a meadow of vegetable mould, which abounds with pine knots and trunks, and was, 30 years before, covered with a grove of white pine-trees. The depth below the surface was 6 feet.

DIMENSIONS OF THE SKELETON.

	FT.	IN.
Height over the shoulders	11	0
Ditto over the hips	9	0
Length from the chin to the rump	15	0

	FT.	IN.
From the point of the tusks to the end of the tail, following the curve	31	0
Length in a straight line	20	0
Width of the hips and body	5	8
Length of the under jaw	2	10
Weight of the same 63½ pounds.		
Width of the head	3	2
Length of the thigh-bone	3	7
Smallest circumference of the same	1	6
Length of the tibia	2	0
Length of the humeras, or large bone of the fore-leg	2	10
Largest circumference of the same	3	2½
Smallest ditto ditto	1	5
Length of the radius	2	5½
Circumference round the elbow	3	8
Length of the scapula, or shoulder-blade	3	1
Length of the longest back-bone	2	3
Longest rib, without cartilage	4	7
Length of the first rib	2	0
Ditto of the breast-bone	4	0
Length of the tusks, defences, or horns	10	7
Circumference of one tooth or grinder	1	6½
Weight of the same, 4lbs. 10oz.		

The whole skeleton weighed about one thousand pounds.

A PILLAR OF FIRE.

From Mrs. Elwood's Travels in Egypt, 1830.

AT Cosseir, a remarkable natural phenomenon is described. The residence was a stone's throw from the sea, and she remarks—

'Conceive my astonishment and surprise, upon repairing thither, on first entering, to gaze on the exquisite beauty of the waves, and to watch the sun, which was just emerging from the bosom of the water, to see the latter, instead of rising in its usual circular form, assume that of a pillar of fire! I positively

doubted the evidence of my senses, and I should scarcely hope to be believed, but that I find the ancients, and Agatharchides in particular, have mentioned the same phenomenon upon these coasts, where they observed 'the sun rise like a pillar of fire.' Lord Valentia also noticed a similar appearance at Mocha, where he saw it set in like manner. We subsequently frequently saw it assume an elongated, but never again so completely columnar a figure. We could but think of the pillar of fire, which for forty years gave light to the Israelites in the wilderness. The colour of the Red Sea here was of the most exquisite blue imaginable, far exceeding in beauty the boasted hue of the Mediterranean. The breakers had a peculiarly vivid and lively whiteness, which by contrast added greatly to the brilliancy of the azure main; but though I could have gazed for hours, it was too dazzling to permit me to do so with impunity.'

CRYSTAL BEDSTEAD.

AMONG the many presents sent to the Schah of Persia, by the emperor of Russia, and which are customary in the East after the conclusion of peace, is a bedstead of extraordinary magnificence. It is entirely made of crystal, and is accessible by steps of the same material, all worked in imitation of large diamonds, incrusted in solid frame. On each side there are spouts made to eject scented water, which by its murmuring invites to sleep. It is crowned by a large chandelier which spreads light in such a manner, over itself and the rest of the frame, as to give to the whole the splendid appearance of millions of diamonds reflecting their brilliancy at once. The bedstead, the only one of the kind ever imagined or attempted, has been worked at the imperial manufactory of St. Petersburgh.

CHARCOAL, DIAMOND, AND LOAF SUGAR.

THE charcoal of commerce contains salt and other impurities; the purest is that sold under the denomination of Lamp-black. Chemically considered, the diamond is pure carbon. The identity of these substances, so apparently dissimilar, is proved by a variety of experiments. By combustion in oxygen gas, it forms the same gas (carbonic acid) as carbon —the oxygen may be separated from this by igniting potassium in it, and the carbon is liberated. Whether the diamond or common charcoal have been employed in the formation of carbonic acid, the residual of carbon, after the decomposition of the gas by potassium, is black and opaque. Mr. Hemming, in a late lecture, said that the incredulity of those who consider it impossible that the diamond was only a purer kind of charcoal might, perhaps, be shaken, if he could prove by an experiment almost as dissimilar in appearance to charcoal, namely, loaf sugar, was really little besides charcoal. A piece of fine white loaf sugar was then dissolved in water, and on applying sulphuric acid to it, the whole mass became instantaneously an opaque black solid substance, which was charcoal!

COAL.

COAL, in greater or less quantities, is found in most countries, at various elevations, (but almost all the great deposits are in low situations), in beds lying over each other of various thicknesses, having between them beds of stony or earthy matters; and it is remarkable that, though these beds of coal are nearly horizontal, they are never quite so, but sink near the middle, so that a section would give the idea of a cup or basin.

The coal-mines of Whitehaven may be considered as the most extraordinary in the known world. They are excavations which have in their structure a considerable resemblance to the gypsum quarries of Paris; and are of such a magnitude and extent, that, in one of them alone, a sum exceeding half a million sterling was, in the course of a century, expended by the proprietors. Their principal entrance is by an opening at the bottom of a hill, through a long passage hewn in the rock, leading to the lowest vein of coal. The greatest part of this descent is through spacious galleries, which continually intersect other galleries, all the coal being cut away, with the exception of large pillars, which, where the mine runs to a considerable depth, are nine feet in height, and about thirty-six feet square at the base. Such is the strength there required to support the ponderous roof.

The mines are sunk to the depth of one hundred and thirty fathoms, and are extended under the sea, to places where there is above them sufficient depth of water for ships of large burden. These are the deepest coal-mines which have ever been wrought; and perhaps the mines have not, in any other part of the globe, penetrated to so great a depth beneath the surface of the sea, the very deep mines in Hungary, Peru, and elsewhere, being situated in mountainous countries, where the surface of the earth is elevated to a great height above the level of the sea.

In these mines there are three strata of coal, which lie at a considerable distance, one above the other, and are made to communicate by pits; but the vein is not always continued in the same regularly inclined plane, the miners frequently meeting with hard rock, by which their further progress is interrupted. At such places there seem to have been breaks in the earth, from the surface downward, one portion appearing to have sunk down, while the adjoining part has preserved its ancient situation. In some of these places the earth has sunk twenty fathoms, and even more,

while in others the depression has been less than one fathom. These breaks the miners call dykes; and, when they reach one of them, their first care is to discover whether the strata in the adjoining part are higher or lower than in the part where they had been working, or, according to their own phrase, whether the coal be cast down or cast up. In the former case they sink a pit; but, if it be cast up to any considerable height, they are frequently obliged, with great labour and expense, to carry forward a level or long gallery through the rock, until they again reach the strata of coal.

The total annual consumption of pit-coal in England is stated to be 23,669,400 tons. A ton is about a cubic yard; and, taking one yard in thickness as the basis of calculation, it will give 305 yards per square mile of annual supply. And, supposing the coal to extend throughout the whole sub-surface of the country, then the whole quantity would be exhausted in about 10,000 years. But, recent observations in some of the Staffordshire mines have shown, that, where some of them have been worked out, the workmen have only to work lower, and they find stratum below stratum, beyond all conjecture where they will stop. Thus we might furnish all the world for a thousand years with coals without fear of exhaustion.—*Shaw's Nature Displayed.*

It was supposed by *Dr. Hutton*, the author of the Huttonian system, that all our beds of coal are nothing more than the condensed smoke of the antediluvian ages; the particles of soot having, according to him, been carried into the sea by rains and rivers—deposited in beds at the bottom,—subsequently covered with beds of sand and gravel, and the whole first melted by subterranean heat, and then calxed and hardened upon emerging above the waters. If this be so, what extensive beds of coal must now be forming in the estuary of the Thames.

THE DOG.

AMONG the various animals which have been rendered subservient to the human race, the dog ranks high in utility and importance. Recurring to the earliest stages of society, we find that, by means of its fleetness, courage, and sagacity, creatures the most ferocious are subdued or obtained for domestication, that it has ever contributed to procure subsistence for man, to watch his personal safety, and to protect his property. If we are not now equally sensible of the advantages resulting from its aid, it is because other substitutes have rendered it less essential.

In a general view of the nature and disposition of the dog, we find it materially affected by the habits of that portion of mankind among whom it dwells. It undergoes a sensible modification. Vicious and ferocious among savage tribes; gentle and docile with those that are humanized. No animal is of equal docility with the dog. By a kind of intuitive faculty he soon learns to distinguish the friends of his master's family, while his own attachment to him remains unimpaired; they are courteously welcomed to his dwelling, but strangers are angrily repulsed. The animals around him are treated as his master would treat them. A natural enemy to wild beasts, the kitten, the fawn, and the leveret domesticated along with him, become objects of regard. He is tractable and complying, submits in patience to his master's resentment, and forgets all his pains in the joy of being restored to a place in his favour. It is from this docility and fidelity of the dog, that mankind have derived the principal services which are now exacted from him; that he has pursued the beasts of the forest, in concert with the rudest of our ancestors, or has watched the drawing of the net, or the deadly aim of the more civilized sportsman. Nor is it in aiding the acquisition of subsistence only, that his use is most conspicuous; he boldly stands

forward the first to defend it, and is the faithful guardian of the night, whose vigilance never sleeps. —BREWSTER'S *Edinburgh Encyclopedia.*

When I see (says Dr. Parsons), and contemplate upon the several actions and designs of my little dog, who gives me much pleasure every day, I profess it is impossible to avoid being amazed. His passions are more quick than those of many men I have taken notice of. There are some whose joy and grief at accidents give them so little emotion, and who are so dull, as to render it difficult to say which it is that affects them; but, in this honest animal, both are lively and strong. When any of my family return home, he shows great gladness in his caressing and skipping about them, and seems dull and concerned at their going out; but there is one among them whom he distinguishes in a most particular manner. When this person goes abroad, he is void of all comfort, and sits in a window, crying incessantly, refusing victuals, and watching for his friend's return, who is always welcomed by much rejoicing and noise. If he wants to go out of the room he puts his fore feet up against one of the company, and, being taken notice of, runs to the door, rising up against it in the same manner, looking at the person he gave notice to before, till he is let out: if he wants to drink, he gives the same notice, and immediately runs into a closet, where stands a bottle of water, continuing to run to and from the person till he is served. Is not this cogitation and sense?—DR. PARSON'S *Philosophical Observations.*

The Greenlanders use these creatures to draw their sledges, yoking four, six, and sometimes eight, to a sledge, loaded with five or six large seals; and it is said, that they often travel sixty miles in a winter's day upon the ice.

In the north of Tartary while the snow is upon the ground, the inhabitants travel in sledges drawn by dogs, which are esteemed swifter and longer lived

than any other dogs; and this may be attributed to their light simple food, which is fish. In the spring, every one sets these animals at liberty, without taking any care about them: then they feed on what they can get in the fields, where they dig for the mice; and in the rivers they catch fish. In the month of October, they are called home by their respective masters, who tie them up near their huts, till they loose a great deal of their fat, that they may be lighter for the roads. These dogs also give certain signs of an approaching storm; for when they stop, if they scrape the snow with their feet, it is advisable, without loss of time, to look out for some village, or other place of safety. And it is said, the dogs here serve instead of sheep, because their skins are used for clothes. Those which are bred up to hunt deer, wild rams, sables, foxes, &c., are sometimes fed with jackdaws, which, it is observed, make their scent the stronger for finding out birds and wild beasts.—SMITH'S *Wonders.*

To recount the *numberless* instances of sincere attachment in this faithful animal, volumes would be insufficient to contain the record; we therefore shall give the following account of a canine chief mourner at a funeral; and conclude this brief panegyric with describing a wonderful speaking dog.

The late Mr. Langford, of Bolsover, Derbyshire, amongst other eccentric provisions in his will, left three shillings per week for the maintenance of a favourite little dog, with an express desire, that on the day of his interment it might be clothed with a sable mantle, and attend his remains as one of the *chief mourners*, which was accordingly done with the greatest pomp and solemnity.

The Dumfries Journul of June, 1829, contains the following extraordinary narrative:—In the year 1815, soon after the battle of Waterloo, a dog came into this world, and, in honour of the hero who achieved the greatest victory of modern times, he was named

'Wellington.' Nothing particular was observed about Wellington, except an unusual degree of sagacity, until about fourteen days ago. Last week we were invited by his owner to pay him a visit, as he said, 'to hear Wellington speak!' We say we were invited to hear a dog speak! Now, though we are not aware that we are more credulous than our neighbours, we accepted the invitation; and, though we were not above twenty minutes in his company, he pronounced our Christian name, which happens to be William, nearly a dozen times, with as much distinctness as the generality of animals with only two legs. We have repeated our visit to him since, and he again repeatedly did us the honour to mention our name. On one of these occasions we were accompanied by two friends, who were as incredulous as we were at first, and as much surprised, but can now bear testimony to what we state. Marvellous and incredible as this may appear, and we are aware that it must do so to most people, the family in whose keeping he is, give the following account of his first attempt at pronunciation:—One of the young men in the family, of the name of William, to whom the dog was much attached, and whom he at the same time feared, finding him lying on the rug one evening, gave the dog a gentle push with his foot to make him get out of the way, on which the dog undergrowled a little, and, on his attempting to give him another push, he uttered William's name very distinctly. The family were surprised, and the animal, in the course of a few seconds, after receiving a little caressing repeated it, and has continued to do so, when desired, ever since.

PORCELAIN TOWER, NANKIN, CHINA.

WITHOUT the gates of several great cities in China there are lofty towers erected, which seems chiefly designed for ornament, and for taking a view of the

adjacent country. The most remarkable of these towers is that of Nankin, called the porcelain tower, from its being entirely covered with porcelain tiles, beautifully painted. It is of an octangular figure, contains nine stories, and is about 200 feet high, being raised on a very solid base of brick-work. The wall at the bottom is at least 12 feet thick; and the building gradually diminishes to the top, which is terminated by a sort of spire or pyramid, having a large golden ball or pine-apple on its summit. It is surrounded by a balustrade of rough marble, and has an ascent of twelve steps to the first floor, from whence one may ascend to the ninth story by very narrow and incommodious stairs, each step being 10 inches deep. Between every story there is a kind of penthouse or shed on the outside of the tower, and at each corner are hung little bells, which, being agitated by the wind, make a pleasant jingling. Each story is formed by large pieces of timber, and boards laid across them. The ceilings of the rooms are adorned with paintings; and the light is admitted through windows made of grates or lattices of wire. There are, likewise, many niches in the wall, filled with Chinese idols; and the variety of ornaments that embellish the whole, render it one of the most beautiful structures in the empire. It has now stood above 350 years, and yet appears to have suffered but little from the corroding tooth of time.

DENSITIES OF BODIES AT DIFFERENT DEPTHS.

Professor Leslie observes that air compressed into the fiftieth part of its volume has its elasticity fifty times augmented: if it continue to contract at that rate, it would, from its own incumbent weight, acquire the density of water at the depth of thirty-four miles. But water itself would have its density

doubled at the depth of 93 miles, and would attain the density of quicksilver at the depth of 362 miles. In descending, therefore, towards the centre, through nearly 4000 miles, the condensation of ordinary substances would surpass the utmost powers of conception. Dr. Young says that steel would be compressed into one fourth, and stone into one eighth of its bulk at the earth's centre. However, we are yet ignorant of the laws of compression of solid bodies beyond a certain limit, though from the experiments of Mr. Perkins they appear to be capable of a greater degree of compression than has generally been imagined.

CONTAGION.

DR. CLANNY, who treated so many cases of the Cholera, at Sunderland, on its first appearance, in his work on the subject, inserts the following curious fact—"February 14th, 1832: Peter Clark, aged 19, residing at Warren-street, informed us that he was at Cronstadt, mate on board the ship Trimdon, when cholera prevailed at that place. There was much thunder and lightning at the time. There frequently fell during the night time, a quantity of yellow substance, very like sulphur in appearance, which covered the water, the ship, and the clothes which the sailors wore at the time. He saw, as well as all the other sailors, the captain take some of this substance and place it upon a sheet of paper, and hold it over a candle, when it inflamed with a blue flame, like what we observe when sulphur is submitted to a similar process. It smelt like sulphur before it was submitted to the flame, and also after it was inflamed. The smell of the air was very sulphurous and offensive. The ship's company were informed by persons from the shore, that the same phenomena were observed on the land. They saw at the same time large quantities of cole-fish lying dead at their sides, and floating round the ship."

THE MONUMENT, LONDON.

UPON Fish-street-hill, on the north side of London-Bridge stands a beautiful and magnificent column of the Doric order, built with Portland stone, called the Monument. This column, which was erected to perpetuate the memory of the fire of London, which broke out near the place where it stands, was begun, according to a design of Sir Christopher Wren, in 1671, and finished in 1676. It is 15 feet in diameter, and 202 feet high from the ground; it stands upon a pedestal 40 feet high, and 21 feet square. On the cap of the pedestal are four dragons, the supporters of the city arms; and between them trophies, with symbols of regality, arts, sciences, and commerce.

Within it is a spiral stair-case of black marble, containing 345 steps, with iron rails, leading to a balcony, which encompasses a cone 32 feet high, and supporting a blazing urn of brass gilt. It is observed of this column, that, like the emperor Trajan's pillar, at Rome, it is built in the form of a candle.

The west side of the pedestal is adorned with emblems by Cibber, of which the eleven principal figures are in alto, and the rest in basso-relievo. The figure to which the eye is particularly directed is a female, representing the city of London, sitting in a languishing posture on a heap of ruins. Behind her is Time, gradually raising her up. At her side a woman, representing Providence, gently touches her with one hand, while, with a winged sceptre in the other, she directs her to regard two goddesses in the clouds, one with a cornucopia, denoting plenty, the other with a palm branch, the emblem of peace. At her feet is a bee-hive, importing that by industry and application the greatest misfortunes may be overcome. Behind Time are citizens, exulting at his endeavours to restore her; and beneath, in the middle of the ruins, is a dragon, the supporter of the city arms, who endeavours to preserve them with his paw.

Still further, at the north end, is a view of the city in flames, with the consternation of the inhabitants. On the other side, on an elevated pavement, stands King Charles II, in a Roman habit, who, approaching the figure representing the city, appears to command three of his attendants to descend to her relief; the first represents the Sciences, the second Architecture, the third Liberty. Behind the king stands his brother, the Duke of York, with a garland in one hand to crown the rising city, and a sword in the other for her defence. Behind him are Justice and Fortitude. In the pavement, under the sovereign's feet, appears Envy, peeping from her cell and gnawing a heart; and, in the upper part of the back ground, the re-construction of the city is represented by scaffolds, erected by the sides of unfinished houses, with builders and labourers at work upon them.

The other sides of the pedestal have each a Latin inscription: that on the north side is an account of the rise, progress, and amazing devastation of the fire of London; the inscription on the south side specifies the prudent and vigorous measures taken by the king and parliament for restoring the city, with great beauty, magnificence, and convenience, and for preventing similar misfortunes for the future; the inscription on the east side contains the names of the lord mayors from the time it was begun till it was finished; and round the upper part of the pedestal is the following inscription in English:—

"This pillar was set up in perpetual remembrance of the most dreadful burning of this protestant city, begun and carried on by the treachery and malice of the popish faction, in the beginning of September, in the year of our Lord 1666, in order to their carrying on their horrid plot, for extirpating the protestant religion, and old English liberty, and introducing popery and heresy."

This inscription, upon the Duke of York's acces-

sion to the crown, was erased; but soon after the revolution, it was restored again.

It has been observed of this monument, that it is undoubtedly the noblest modern column in the world: and that, in some respects, it may vie with those celebrated ones of antiquity which are consecrated to the names of Trajan and Antoninus.—SMITH'S *Wonders.*

FALLS OF NIAGARA.

ABOUT six leagues from the fort of Niagara, in Canada, is the greatest cataract in the world, known by the name of the *Waterfall of Niagara.* The river at this fall runs from S. S. E. to N. N. W.; and the rock of the fall forms a kind of figure like a hollow semicircle or horse-shoe. Above the fall, in the middle of the river, is an island about 800 feet long; the lower end of which is just at the perpendicular edge of the fall. Before the water comes to this island, it runs but slowly compared with its motion afterwards, when it grows extremely rapid, running with a surprising swiftness before it comes to the fall. It is perfectly white, and in several places is thrown high up into the air. The water that runs down on the west side is in greater abundance and whiter than that on the opposite side; and seems almost to outfly an arrow in swiftness. When a person is at the fall and looks up the river, he may perceive that the water is every where exceedingly steep, almost like the side of a hill; but on looking at the fall itself, it is impossible to describe the astonishment it occasions.

The height of the cataract, as measured by mathematical instruments, is found to be exactly 137 feet; and when the water is come to the bottom it flies back to a great height in the air. The noise may sometimes be heard at the distance of 40 miles, but

seldom farther. At some times the fall makes a much greater noise than at others; and this is regarded as an infallible prognostic of rain or other bad weather.

From the place where the water falls there arises a prodigious vapour, like a thick smoke, insomuch that when viewed at a distance, a stranger might suppose that the Indians had set their forests on fire. These vapours rise very high in the air when it is calm, but are dispersed by the wind when it blows hard. If any person goes into this vapour, or if the wind blows it on him, it is so penetrating, that in a few moments he will be as wet as if immersed in water.

Some persons are of opinion, that when birds happen to fly into the smoke of the fall, they immediately drop down and perish in the water; either because their wings are become wet, or that the tremendous roar of the fall astonishes and confounds them; but others think, that this idea is merely chimerical, because among the great numbers of birds found dead below the fall, there are no other sorts than such as live and swim frequently in the water, as swans, geese, ducks, teal, &c. Great flocks of these animals are often seen going to destruction in the following manner: They swim in the river above the fall, and so are carried down lower and lower by the water; and as water-fowl are commonly pleased with being carried by the stream, they indulge themselves in this pleasure, till the rapidity of the water renders it impossible for them to rise, and they are consequently hurried down the precipice.

In the months of September and October, such prodigious quantities of dead water-fowl are found every morning below the fall, that they afford ample subsistence for the garrison at the fort. There also are frequently found the bodies of deer, bears, and other animals, which have attempted to cross the water above the fall. Some melancholy instances of human beings having lost their lives in a similar

manner, are related by travellers; and the following one is too affecting to be passed over in silence:—

An unfortunate Indian was reposing, in a state of inebriety, in his canoe, which was properly secured, at the distance of some miles above the cataracts, while his wife sat on the shore to watch his slumbers. After some time, a sailor, from one of the vessels on the lake, happened to arrive at the spot, and began to take some indecent liberties with the Indian female. The woman naturally attempted to rouse her husband, but before she could effect her design, the brutal mariner cut the cord of the canoe and set it adrift. The little vessel glided swiftly down the stream, and in the space of a few minutes it was seen to enter the Rapids. The Indian, awakened by the violent motion of the waves, started up, and on perceiving his perilous situation, he grasped his paddle with a look of inexpressible horror; but finding it absolutely impossible to stem the force of the current, he calmly wrapped himself up in his blanket, and resumed his former position at the bottom of the canoe. In the space of a few moments, he was hurried down the precipice, and was never discovered more.

There is an island in the middle of the fall, which was formerly supposed inaccessible: but an accident that happened about sixty years ago made it appear otherwise. Two Indians went out from Fort Niagara to hunt upon an island that is situated in the middle of the river, above the great fall, which was then stocked with abundance of deer; but having indulged too freely in the use of some French brandy, they fell asleep, and their canoe drove back with the stream till it approached that island which is in the middle of the fall. They were awakened by the noise of the cataract, and began to give themselves over as lost, but after some vigorous exertions, they effected a landing upon the island. At first they exulted in the idea of their escape; but, upon cool

reflection, they found themselves hardly in a better state than if they had gone down the fall, since they had no other alternative than either to throw themselves down the same or perish with hunger. After some time, however, hard necessity put them on invention; and as they found plenty of wood on the island, they made a ladder of the bark of the lind-tree, in order to reach the water below; one end of this ladder they fastened to a large tree that grew on the side of a rock above the fall, and let the other end down to the water. By this contrivance they descended to the bottom in the middle of the fall; and then threw themselves out into the water, thinking to swim on shore. Scarcely, however, had they begun to swim, before they were thrown back with violence against the rock from which they came, and after several fruitless attempts, they were compelled to re-ascend to the island. After some time, they discovered Indians on the shore, who appeared to pity their misfortune, but gave them little hope of assistance. These, however, ran to inform the commandant of the fort of the situation of their friends, and he soon projected the means of their deliverance in the following manner:—

The water that runs on the west side of this island is shallow, especially towards the eastern shore. The commandant, therefore, caused some poles to be made and pointed with iron, and by the help of these, two Indians offered to walk to the island to save their unfortunate brethren, or to perish in the attempt. Each had two such poles in his hands to set to the bottom of the stream, in order to keep him steady, and in this manner they safely reached the island, and brought away the poor creatures, who were almost perishing for want of food.

On the west side of this island are some small rocks; and in former times, a part of the rock at this side of the fall hung over in such a manner, that the water which fell perpendicularly from it, left

a vacancy below, so that people could go under, between the rock and the water; but, some years ago, the prominent part broke off and fell down. The breadth of the fall, as it runs in a semicircle, is reckoned to be about 300 feet.

Every day when the sun shines, from ten o'clock in the morning till two in the afternoon may be seen, below the fall, the similitude of a beautiful rainbow, and sometimes two, one within another. The brightness and clearness of this phenomenon depends on the quantity of vapour that results from the spray of the cataract: for when the wind drives the vapours away, the rainbow disappears; but as soon as new vapours come, it resumes its former appearance. The rock of the fall consists of a grey lime-stone.—SMITH'S *Wonders.*

EXTRAORDINARY SPECIMENS OF HUMAN INGENUITY.

IN the Cathedral at Augsburg, there are to be seen some rare specimens of drinking-glasses, made hollow, and well-shaped, with a ring made of the piece in turning, which plays between the bottom and body of the glass, and cannot be taken off. There are 100, with their rings, in a grain of pepper of an ordinary size. 'I often,' says Misson, in his Voyage to Italy, 'examined this little miracle of art with a good microscope, and observed the stripes and traces of the tool with which they are turned; so that they have no secret in it, but that it was the pure work of the eyes and the hand.'

They have also another curiosity here—fleas fastened by the neck with chains of steel. This chain is so fine, that, though it be nearly a span long, the flea will lift it up when he leaps.

Mark Scaliot, blacksmith, of London, in 1578, made for exhibition and trial of skill one lock of iron,

steel, and brass, of eleven several pieces, and a pipe key, all clean wrought, which weighed but one grain of gold. He also made a chain of gold, of 43 links, to which was fastened the lock and key; and, being put about the neck of a flea, she drew the same with ease. The chain, lock, and key, weighed but one grain and a half.

In 1829, a man exhibited, by candle-light, in London, two fleas, one drawing a kind of car, and the other a lock and chain, with the greatest ease. In Nottingham, also, in the same year, there were two fleas shown, which had gold chains placed round their necks; one of them drew a carved cherry-stone, and the other a silver cannon.

In 1711, Mr. Penkethman exhibited a wonderful invention, called 'The Pantheon, or the Temple of the Gods;' the work of several years and great expense. It was a most surprising and magnificent machine, consisting of five several curious pictures, the painting and contrivance whereof were truly admirable. The figures, above 100 in number, moved their heads, legs, arms, and fingers, exactly to what they performed, and set one foot before another like living creatures.

'The Germaine Master-Piece, being that Famous Knife, which hath been for some time in England, and highly applauded by the most exquisite artists; containing in the haft sixty odd several figures, some engraved, others carved, and all to the admiration of those that behold them. It hath two keys, which open seaven locks, including those various Rarities contained therein; it was seaven years a makeing, and valued by the Authour, that famous artist of Germany, at Fifteen Hundred Pounds, and is now exposed to publique view for England's Satisfaction. To be seen at Bartholomew Faire, against the King's Head, with other rarities, by me, JOHN GIFFORD.' —*Copied from the original Har. MS.* 5949.

The following copy of a hand-bill printed in 1745,

enumerates certainly a rare display of miracles of art:—

'To be seen at Mr. Bovericks's, watchmaker, at the Dial, facing Old Round Court, near the New Exchange in the Strand, at One Shilling each person.

'The Little Furniture of a Dining-Room, consisting of a dining-table, with a cloth laid; two figures seated as at dinner; a footman waiting: a card-table, which opens with a draw in it; frame and castors; looking-glass; two dozen of dishes; twenty dozen of plates; thirty dozen of spoons; and twelve skeleton-back chairs, with claw feet. All the above particulars are contained in a cherry-stone.

'A Landau, which opens and shuts by springs, hanging on braces, with four persons sitting therein; a crane-neck carriage, the wheels turning on their axles; a coachman's box, &c., of ivory; together with six horses and their furniture; a coachman on the box, a dog between his legs, the reins in one hand, and whip in the other; the footman behind, and a postilion on the leading horses, in their proper liveries;—all so minute as to be drawn along by a flea. It has been shown to the Royal Society, and several of the nobility and gentry.

'The Curious Little Four-Wheel open Chaise, with the figure of a man in it, all made of ivory, drawn by a flea; which performs all the offices of a large chaise, as running of the wheels, locking, &c.; weighing but one grain. Shown to the royal family, and several of the nobility and gentry,

'A Flea, chained by a chain of 200 links, with a padlock and key, curiously wrought; the chain and flea, padlock and key, weighing but one-third of a grain.

'A Camel that passes through the Eye of a Middle-Sized Neeedle.

'And a Curious Pair of Steel Scissors, so minute as six pair may be wrapped up in the wing of a fly; the said scissors cut a large horse-hair.

'To be seen from nine in the morning till eight at night; and those that please to see them at their house may be waited upon on Thursdays, at any hour.'

At Lucern, in Switzerland, an effort of human industry presents itself to our view through the perseverance and ingenuity of General Pfiffer, a native of Lucern. It is the topography of the mountainous part of Switzerland, which is very curious; and is a model in relief, about twelve feet long and nine and a half broad, comprising about 160 square miles. The composition is principally a mastic of charcoal, lime, clay, pitch, and a thin coat of wax, but so hard that it may be trod on without damage. The whole is painted to nature, and represents the vegetable productions, the strata, lakes, towns, villages, and every object that can deserve the least attention. This representation is taken from actual survey, and has employed the General for many years. The elevations are taken from the level of the Lake Lucern, which, according to M. Saussure, is about 1408 feet above the Mediterranean Sea.

But, of the efforts of human ingenuity and perseverance, that exhibited in London in 1833, by M. Bertolotto, is the most surprising. He succeeded in producing an exhibition, in which a first-rate man-of-war, of 120 guns, with rigging, sails, anchor, and every thing requisite in a three-decker, not omitting a numerous crew, placed on a car of gold, with four wheels, were drawn by a single flea.—A four-wheeled carriage on springs, with four persons inside, the coachman on the box, and a footman behind, was drawn by a single flea.—A gold chain of two hundred links, a golden ball at the other extremity, was drawn by another flea.—Fleas, with golden saddles, bridles, &c., carried figures of proportionable size, representing Buonaparte and one of his aide-de-camps. Another flea drew up and let down a bucket from a well; and two other fleas fought a duel.—In addition to the above, there was a representation of the seige of

Antwerp, in which the fort is attacked by fleas with fire-arms and cannon, the explosion being heard by the visitors, and General Chassé and Marshal Gerard appearing on horseback—or fleaback, more properly, —encouraging their warriors to action. This melo-drama is followed by a grand ballet, in which four of the performers, dressed in male and female attire, dance a quadrille, to the music of a band of fleas, playing on different instruments, of which the tones are audible to the company!—After this our readers will be in no wise astounded at hearing of a mail-coach drawn by two fleas in complete harness, or a representation of his Majesty's stag-hunt, the stag and his pursuers personified by fleas!

PHENOMENA OF THE OCEAN.

THAT huge mass of waters impregnated with salt, which encompasses all parts of the globe, and by the means of which, in the present improved state of navigation, an easy intercourse subsists between the most distant nations, is denominated THE OCEAN, and has three grand divisions assigned to it. First: That vast expanse of water which lies to the westward of the northern and southern continents of America, and by which these continents are divided from Asia. On account of the uniform and temperate gales which sweep its surface within the tropics, it is named "the Pacific Ocean;" and has again been distinguished into the Northern and Southern Pacific, the equator being considered as the boundary of each, and "the Southern Ocean," or South Sea, being, consequently, that part of the general assemblage of waters which roll in the direction from about the fortieth degree of latitude towards the south pole. Its general width is estimated at about ten thousand miles. Secondly: The "Atlantic Ocean," which divides Europe and Africa from the two American

continents, and has a general width of about three thousand miles; while the waters which occupy the polar regions are named "The Northern Sea." And, lastly: "The Indian Ocean," which extends from the eastern shores of Africa along the southern coasts of Asia, and has the same general width with the preceding one.

Among the chief of those less expansive sheets of water, properly called seas, may be mentioned the Baltic, the Mediterranean Sea, and the Black and Red Seas. The Caspian Sea, being entirely encompassed by land, might, with more propriety, have been styled a lake; but as its water possesses the quality of saltness, it is ranked among the seas. It is, notwithstanding, certain that Lake Superior, in North America, has a still greater circumference, extending around its shores at least fourteen hundred miles, while the extent of the Caspian Sea does not exceed twelve hundred.

Of the origin of this division into different seas, and seas of different depths, little is known; but it is highly probable that many of the larger excavations and partitions now met with, have existed, without much change as to their extent, from the creation. Others have undoubtedly been the result of that conflict which is perpetually taking place between the elements of land and water, and which has, for the greater part, given rise to islands, isthmuses, and peninsulas; while subterraneous volcanoes, and those truly surprising and indefatigable exertions of corals, madrepores, tubifores, and other restless and multitudinous zoophites, have laid, and are daily laying the foundation of new islands and continents in the middle of the widest and deepest seas.

The *quantity* of water in the ocean not only remains constantly the same; but, notwithstanding its most violent and incessant motion, continues *stable* within certain limits. This, however, is what cannot

be inferred from observation; for, although in the almost infinite variety of disturbances to which the ocean is liable, from the action of irregular causes, it may appear to return to its former state of equilibrium, still it may be apprehended that some extraordinary cause may communicate to it a shock, which, though inconsiderable at its origin, may augment continually, and elevate it above the highest mountains. It is, therefore, interesting to investigate the conditions which are necessary for the absolute stability of the ocean. This has been effected by the celebrated Laplace, who has demonstrated that the equilibrium of the ocean *must* be stable, if its density be *less* than the mean density of the earth, which is known to be the case. He has likewise determined, by means of his refined analysis; that this stability would cease to exist, if the mean density of the sea *were to exceed* that of the earth; so that the stability of the equilibrium of the ocean, and the excess of the density of the terrestrial globe above that of the waters which cover it, are reciprocally connected with each other, and indicate infinite wisdom and contrivance in such an adjustment.

THE DEPTH OF THE OCEAN.

As far as it can be determined by any observations hitherto made, the greatest depth of the sea appears to be that lately ascertained by Captain Phipps, in the Atlantic, where the lead descended to a depth of 4680 feet, without encountering any impediment. In proportion to the descent from the surface of the ocean must be the diminution of light: a fact, which has been corroborated by the experience of divers and fishers of pearls. According to Lambert's showing, the light of the full moon is three hundred times weaker than the light of the sun; and it is consequently asserted by *Dr. Schmidt*, of Gottingue, that, at a depth of 117 feet below the surface of the

sea, the power of day-light has declined to that possessed by the rays of the full moon.

SALTNESS OF THE SEA.

Of the various phenomena of the sea, that of its saltness is one of the most obvious. No questions concerning the natural history of our globe have been discussed with more attention, or decided with less satisfaction, than that concerning its primary cause, which had perplexed the philosophers before the time of Aristotle, and surpassed even the great genius of that profound enquirer into natural causes. Father Kircher, after having consulted not less than thirty-three authors on this subject, could not help remarking, that the fluctuations of the ocean itself were scarcely more various, than the opinions concerning the origin of its saline impregnation.

This question does not seem capable of admitting an illustration from experiment; at least, not any experiments have been hitherto made for that purpose: it is, therefore, not surprising that it remains nearly as problematical in the present age, as it has been in any of the preceding. Had observations been made three or four centuries ago, to ascertain the then saltness of the sea, at any particular time and place, we might now, by making similar observations at the same place, in the same season, have been able to know, whether the saltness, at that particular place, was an increasing, or a decreasing, or an invariable quantity. This kind and degree of knowledge would have served as a clue to direct us to a full investigation of this matter in general. It is to be regretted, however, that observations of this nature, have not, until very lately, been made with any degree of precision.

One of the principal opinions maintained on this subject by modern philosophers, and more particularly supported by Doctor Halley, is, that since river water, in almost every part of the globe, is impreg-

nated, in a greater or less degree, by sea-salt, the sea must have gradually acquired its present quantity of salt from the long-continued influx of rivers. The water which is carried into the sea by these rivers, is again separated from it by evaporation, and being dispersed over the atmosphere by winds, soon descends in rain or vapour upon the surface of the earth, whence it hastens to pour into the bosom of the ocean the fresh tribute of salt it has collected in its inland progress. Thus the salt conveyed into the sea not being a volatile substance, nor performing an incessant circulation, must be a perpetually increasing quantity; and, sufficient time, it is contended, has elapsed, since the creation, for the sea to acquire from this source its present quantity of salt.

This opinion has been successively combated; and it is denied that fresh water rivers can, in the course of many thousand years, have produced saltness in the sea. If this were the case, every sea, or great body of water, which receives rivers, must have been salt, and have possessed a degree of saltness in proportion to the quantity of water which these rivers discharge. But so far is this from being true, that the Palus Mæotis, and the great American lakes, do not contain salt water but fresh. It may indeed be objected, that the quantity of salt which rivers carry along with them, and deposit in the sea, must depend on the nature of the soil through which they flow, which may in some places not contain any salt; and that this is the reason why the great lakes in America, and the Palus Mæotis are fresh. But to this opinion, which is merely hypothetical, there are insurmountable objections. It is a curious fact, that the saltness of the sea is greatest under the line, and diminishes gradually towards the poles; but it cannot therefore be assumed that the earth contains more salt in the tropical regions than in the temperate zones, and more in these again than in the frigid zones. On the other hand, if it be allowed that the

sea receives its saltness from the rivers, it must be equally salt, or nearly so, in every part of the earth; since, according to a simple and well known principle in chemistry, *when any substance is dissolved in water with the assistance of agitation, at whatever part of the water it is introduced, it will be equally diffused through the whole liquid.* Now, though it were true that a greater quantity of salt should have been introduced into the sea under the line, than towards the poles, from the constant agitation occasioned by the wind and tide, the saltness must have soon pervaded the whole mass of water. Neither is this greater proportion of saltness owing to a superior degree of heat, since it is an established principle in chemistry, that cold water and hot water dissolve nearly the same proportion of salt.

The saltness of the sea has also been ascribed to the solution of subterraneous mines of salt, which is supposed to abound in the bottom of the sea, and along its shores. But this hypothesis cannot be supported. If the sea were constantly dissolving salt, it would soon become saturated; for it cannot be said that it is deprived of any portion of its salt by evaporation, since rain water is fresh. If the sea were to become saturated, neither fishes nor vegetables could live in it. It may hence be inferred that the saltness of the sea cannot be accounted for by secondary causes, and that it has been salt since the beginning of time. It is, indeed, impossible to suppose that the waters of the sea were at any time fresh since the formation of fishes and sea-plants; for, as these will not live in water saturated with salt, neither will they live in water which is fresh. It may hence be concluded that the saltness of the sea has, with some few exceptions, perhaps, arising from mines of rock salt dispersed near its shores, been nearly the same in all ages. This hypothesis, which is the simplest, and is involved in the fewest difficulties, best explains the various phenomena dependent on the saltness of the sea.

Although this saline property may be one of the causes by which the waters of the sea are preserved from putridity, still it cannot be considered as the principal cause. The ocean has, like rivers, its currents, by which its contents are circulated round the globe; and these may be said to be the great agents which keep it sweet and wholesome. A very enlightened navigator, Sir John Hawkins, speaks of a calm in which the sea, having continued for some time without motion, assumed a very formidable aspect. "Were it not," he observes, "for the moving of the sea, by the force of winds, tides, and currents, it would corrupt all the world. The experiment of this, I saw in the year 1590, lying with a fleet about the islands of Azores, almost six months, the greater part of which time we were becalmed. Upon which all the sea became so replenished with various sorts of gellies, and forms of serpents, adders, and snakes, as seemed wonderful; some green, some black, some yellow, some white, some of divers colours, and many of them had life; and some there were a yard and a half, and two yards long; which, had I not seen, I could hardly have believed. And hereof are witnesses all the companies of the ships which were then present; so that hardly a man could draw a bucket of water clear of some corruption. In which voyage, toward the end thereof, many of every ship fell sick, and began to die apace. But the speedy passage into our country, was a remedy to the crazed, and a preservative to those who were not touched."

LUMINOUS POINTS IN THE SEA.

Among the phenomena which have long exercised the sagacity of philosophers, that of the luminous appearance of the surface of the sea, during the obscurity of the night, is highly curious. A variety of experiments were made by a French naturalist at Cayenne, at different seasons, to ascertain its true cause; and to him it appeared that these luminous

points were produced by motion and friction alone, as he could not, with the help of the best glasses, perceive any insects floating in the water. But it would seem, from the experiments and observations of many learned men, that this phenomena is produced by various causes both jointly and separately. It has been proved by one set of experiments, that the putrefaction of animal substances produces light and scintillation in the sea. A little white fish placed in sea-water rendered it luminous in the space of twenty-eight hours. On another hand, it is certain that there is in the sea a prodigious quantity of shining insects, or animalcules, which contribute to this phenomenon. A French astronomer, M. Dangelet, who returned from Terra Australis in 1774, brought with him several kinds of worms which shine in water, when it is set in motion; and M. Rigaud affirms, that the luminous surface of the sea, from Brest to the Antilles, contains an immense quantity of little, round, shining polypi, of about a quarter of a line in diameter. Other learned men, who acknowledge the existence of these luminous animals, cannot, however, he persuaded to consider them as the cause of all that light and scintillation which appear on the surface of the ocean. They imagine that some substance of a phosphoric nature, arising from putrefaction, must be admitted as one of the causes of this phenomenon. By other naturalists it has been ascribed to the oily and greasy substances with which the sea is impregnated; in proof of which a kind of fish, resembling the tunny, is cited, as being provided with an oil which shines with considerable lustre.

The Abbé Nollet was convinced, by a series of experiments, that this phenomenon is caused by small animals, either by their luminous aspect, or by some liqour or effluvium which they emit. He did not, however, exclude other causes; and among these, the spawn or fry of fishes is deserving of attention.

M. Dangelet, in sailing into the bay Antongil, in the island of Madagascar, observed a prodigious quantity of fry, which covered the surface of the sea for the extent of more than a mile, and which he, at first, on account of its colour, mistook for a bank of sand. This immense accumulation of spawn or fry exhaled a disagreeable odour; and it should be remarked that the sea had, for some days before, appeared with uncommon splendour. The same accurate observer, perceiving the sea remarkably luminous in the road of the Cape of Good Hope, during a perfect calm, remarked that the oars of the canoes produced a whitish and pearly kind of lustre: when he took in his hand the water, which contained phosphorus, he discerned in it, for some minutes, globules of light as large as the heads of pins. On pressing these globules, they appeared to his touch like a soft and thin pulp; and some days after the sea was covered with entire banks of small fishes, in innumerable multitudes.

From all these facts it may be deduced, that various causes contribute to the light and scintillation of the sea; and that the light which the Cayenne naturalist attributed to agitation and friction, differs from that which is extended far and near, seeming to cover the whole surface of the ocean, and producing a very beautiful and striking appearance, particularly in the torrid zone, and in the summer season.

OF THE TIDES, MOTION, AND CURRENTS OF THE SEA; WITH THEIR EFFECTS.

It has before been said, that the waters of the sea were kept sweet by their motion; without which they would soon putrefy, and spread universal infection. If we look for final causes, here, indeed, we have a great and an obvious one that presents itself before us. Had the sea been made without motion, and resembling a pool of stagnant water, the nobler races of animated nature would shortly be at an end. Nothing would then be left alive but swarms of ill-

formed creatures, with scarce more than vegetable life; and subsisting by putrefaction. Were this extensive bed of waters entirely quiescent, millions of the smaller reptile kinds would there find a proper retreat to breed and multiply in: they would find there no agitation, no concussion in the parts of the fluid to crush their feeble frames, or to force them from the places where they were bred: there they would multiply in security and ease, enjoy a short life, and putrefying thus again, give nourishment to numberless others, as little worthy of existence as themselves. But the motion of this great element effectually destroys the number of these viler creatures; its currents and its tides produce continual agitations, the shock of which they are not able to endure; the parts of the fluid rubbing against each other destroys all viscidities; and the ocean, if I may so express it, acquires health by exercise.

The most obvious motion of the sea, and the most generally acknowledged is that of its tides. This element is observed to flow for certain hours from south towards the north; in which motion or flux, which lasts about six hours, the sea gradually swells; so that entering the mouths of rivers, it drives back the river-waters to their heads. After a continual flux of six hours, the sea seems to rest for a quarter of an hour; and then begins to ebb, or retire back again, from north to south, for six hours more; in which time the waters sinking, the rivers resume their natural course. After a seeming pause of a quarter of an hour, the sea again begins to flow as before; and thus it has alternately risen and fallen, twice a-day, since the creation.

This amazing appearance did not fail to excite the curiosity, as it did the wonder of the ancients. After some wild conjectures of the earliest philosophers, it became well known in the time of Pliny, that the tides were entirely under the influence, in a small degree, of the sun; but in a much greater of the

moon. It was found, that there was a flux and reflux of the sea, in the space of twelve hours, fifty minutes, which is exactly the time of a lunar day. It was observed, that whenever the moon was in the meridian, or, in other words, as nearly as possible over any part of the sea, that the sea flowed to that part, and made a tide there; on the contrary, it was found that when the moon left the meridian, the sea began to flow back again from whence it came; and there might be said to ebb. Thus far the waters of the sea seemed very regularly to attend the motions of the moon. But it appeared likewise, that when the moon was in the opposite meridian, so far off on the other side of the globe, that there was a tide on this side also; so that the moon produced two tides, always at the same time; one on the other part of the globe directly under her; and the other on the part of the globe directly opposite.

Mankind continued for several ages content with knowing the general cause of these wonders, hopeless of discovering the particular manner of the moon's operation. Kepler was the first who conjectured that attraction was the principal cause, asserting, that the sphere of the moon's operation extended to the earth, and drew up its waters. The precise manner in which this is done, was discovered by Newton.

The moon has been found, like all the rest of the planets, to attract, and to be attracted by the earth. This attraction prevails throughout our whole planetary system. The more matter there is contained in any body, the more it attracts; and its influence decreases in proportion as the distance, when squared, increases. This being premised, let us see what must ensue upon supposing the moon in the meridian of any track of the sea. The surface of the water immediately under the moon is nearer the moon than any other part of the globe is; and, therefore, must be more subject to its attraction than the waters any where else. The waters will, therefore, be attracted

by the moon, and rise in a heap; whose eminence will be the highest where the attraction is greatest. In order to form this eminence, it is obvious that the surface, as well as the depths, will be agitated; and that wherever the waters run from one part, succeeding waters must run to fill up the space it has left. Thus the waters of the sea, running from all parts to attend the motions of the moon, produce the flowing of the tide; and it is high tide at that part wherever the moon comes over it, or to its meridian.

But when the moon travels onward, and ceases to point over the place where the waters were just risen, the cause here of their rising ceasing to operate, they will flow back by their usual gravity into the lower parts from whence they had travelled, and this retiring of the waters will form the ebbing of the sea.

Thus the first part of the demonstration is obvious; since, in general, it requires no great sagacity to conceive that the waters nearest the moon are the most attracted, or raised highest by the moon. But the other part of the demonstration, namely, how there came to be high tides at the same time, on the opposite side of the globe, and where the waters are farthest from the moon, is not so easy to conceive. To comprehend this, it must be observed that the part of the earth and its waters that are farthest from the moon, are the parts of all others that are least attracted by the moon: it must also be observed, that all the waters, when the moon is on the opposite side of the earth, must be attracted by it in the same direction that the earth itself attracts them; that is, if I may so say, quite through the body of the earth, towards the moon itself. This, therefore, being conceived, it is plain that those waters which are farthest from the moon, will have less weight than those of any other part, on the same side of the globe; because the moon's attraction, which conspires with the earth's attraction, is there least. Now, therefore, the waters farthest from the moon, having less weight,

and being lightest, will be pressed on all sides by those that, having more attraction, are heavier; they will be pressed, I say, on all sides; and the heavier waters flowing in will make them swell and rise, in an eminence directly opposite to that on the other side of the globe, caused by the more immediate influence of the moon.

In this manner, the moon, in one diurnal revolution, produces two tides; one raised immediately under the sphere of its influence, and the other directly opposite to it. As the moon travels, this vast body of waters rears upward, as if to watch its motions; and pursues the same constant rotation. However, in this great work of raising the tides, the sun has no small share; it produces its own tides constantly every day, just as the moon does, but in a much less degree, because the sun is at an immensely greater distance. Thus there are solar tides and lunar tidés. When the forces of those two great luminaries concur, which they always do when they are either in the same or in opposite parts of the heavens, they jointly produce a much greater tide, than when they are so situated in the heavens as each to make peculiar tides of their own. To express the very same thing technically; in the conjunctions and oppositions of the sun and moon, the attraction of the sun conspires with the attraction of the moon; by which means the high spring-tides are formed. But in the quadratures of the sun and moon, the water raised by the one is depressed by the other; and hence the lower neap-tides have their productions. In a word, the tides are greatest in the syzigies, and least in the quadratures.

This theory, well understood, and the astronomical terms previously known, it may readily be brought to explain the various appearances of the tides, if the earth were covered with a deep sea and the waters uninfluenced by shoals, currents, straits, or tempests.

But in every part of the sea near the shores, the geographer must come in to correct the calculations of the astronomer. For, by reason of the shallowness of some places, and the narrowness of the straits in others, there arises a great diversity in the effect, not to be accounted for, without an exact knowledge of all the circumstances of the place. In the great depths of the ocean, for instance, a very slow and imperceptible motion of the whole body of water will suffice to raise its surface several feet high; but, if the same increase of water is to be conveyed through a narrow channel, it must rush through it with the most impetuous rapidity. Thus, in the English Channel, and the German Ocean, the tide is found to flow strongest in those places that are narrowest; the same quantity of water being, in this case, driven through a smaller passage. It is often seen, therefore, pouring through a strait with great force; and by its rapidity, considerably raised above the surface of that part of the ocean into which it runs.

This shallowness and narrowness in many parts of the sea give also rise to a peculiarity in the tides of some parts of the world. For in many places, and in our own seas in particular, the greatest swell of the tide is not while the moon is in its meridian height, and directly over the place, but some time after it has declined from thence. The sea, in this case, being obstructed, pursues the moon with what dispatch it can, but does not arrive with all its waters till long after the moon has ceased to operate. Lastly, from this shallowness of the sea, and from its being obstructed by shoals and straits, we may account for the Mediterranean, the Baltic, and the Black Sea, having no sensible tides. These, though to us they seem very extensive, are not however large enough to be affected by the influence of the moon; and as to their communication with the ocean, through such narrow inlets, it is impossible in a few

hours' time, that they should receive and return water enough to raise or depress them in any considerable degree.

In general, therefore, we may observe, that all tides are much higher, and more considerable, in the torrid zone, than in the rest of the ocean; the sea, in those parts, being generally deeper, and less affected by changeable winds, or winding shores. (Buffon, vol. ii. p. 187.) The greatest tide we know of is that at the mouth of the river Indus, where the water rises thirty feet in height. How, great, therefore, must have been the amazement of Alexander's soldiers at so strange an appearance! They, who always before had been accustomed only to the scarcely perceptible risings of the Mediterranean, or the minute intumescence of the Black Sea, when made at once spectators of a river rising and falling thirty feet in a few hours, must no doubt have felt the most extreme awe, and, as we are told, (Quintus Curtius,) a mixture of curiosity and apprehension. The tides are also remarkably high on the coasts of Malay, in the Straits of Sunda, in the Red Sea, at the mouth of the river St. Lawrence, along the coasts of China and Japan, at Panama, and in the Gulf of Bengal. The tides at Tonquin, however, are the most remarkable in the world. In this part there is but one tide, and one ebb in twenty-four hours; whereas, as we have said before, in other places there are two. Besides, there, twice in each month, there is no tide at all when the moon is near the equinoctial, the water being for some time quite stagnant. These, with some other odd appearances attending the same phenomena, were considered by many as inscrutable; but Sir Isaac Newton, with peculiar sagacity, adjudged them to arise from the concurrence of two tides, one from the South Sea, and the other from the Indian Ocean. Of each of these tides there come successively two every day; two at one time greater, and two at another time that are less. The time be-

tween the arrival of the two greater is considered by him as high tide; the time between the two lesser as ebb. In short, with this clue, that great mathematician solved every appearance, and so established his theory as to silence every opposer.

This fluctuation of the sea from the tides produces another and more constant rotation of its waters, from the east to the west, in this respect following the course of the moon. This may be considered as one great and general current of the waters of the sea; and although it be not everywhere distinguishable, it is nevertheless everywhere existent, except when opposed by some particular current or eddy, produced by partial or local causes. This tendency of the sea towards the west is plainly perceivable in all the great straits of the ocean; as, for instance, in those of Magellan, where the tide, running in from the east, rises twenty feet high, and continues flowing six hours; whereas, the ebb continues but two hours, and the current is directed to the west. This proves that the flux is not equal to the reflux; and that from both results a motion of the sea westward, which is more powerful during the time of the flux than the reflux.

But this motion westward has been sensibly observed by navigators, in their passage back from India to Madagascar, and so on to Africa. In the great Pacific Ocean, also, it is very perceivable; but the places where it is most obvious are, as was said, in those straits which join one ocean to another. In the straits between the Maldivia Islands, in the Gulf of Mexico, between Cuba and Jucatan. In the straits of the Gulf of Paria, the motion is so violent that it hath received the appellation of the Dragon's Mouth. Northward, in the sea of Canada, in Waigat's Straits, in the Straits of Java, and, in short, in every strait where the ocean on one part pours into the ocean on the other. In this manner, therefore, is the sea carried with an unceasing circulation round

the globe; at the same time that its waters are pushed back and forward with the tide, they have thus a progressive current to the west, which, though less observable, is not the less real.

Besides these two general motions of the sea, there are others which are particular to many parts of it, and are called currents. These are found to run in all directions, east, west, north, and south; being formed, as was said above, by various causes; the prominence of the shores, the narrowness of the straits, the variation of the wind, and the inequalities at the bottom. These, though no great object to the philosopher, as their causes are generally local and obvious, are nevertheless of the most material consequence to the mariner; and without a knowledge of which he could never succeed. It often has happened, that when a ship has unknowingly got into one of these, every thing seems to go forward with success, the mariners suppose themselves every hour approaching their wished-for port, the wind fills their sails, and the ship's prow seems to divide the water; but, at last, by miserable experience, they find, that instead of going forward, they have been all the time receding. The business of currents, therefore, makes a considerable article in navigation; and the direction of their stream, and their rapidity, have been carefully set down. This some do by the observation of the surface of the current; or by the driving of the froth along the shore; or by throwing out what is called the log-line, with a buoy made for that purpose, and by the direction and motion of this, they judge of the setting, and the rapidity of the current.

These currents are generally found to be most violent under the equator, where indeed all the motions of the ocean are most perceivable. Along the coast of Guinea, if a ship happens to overshoot the mouth of any river it is bound to, the current prevents its return; so that it is obliged to steer out to sea, and take a very large compass in order to correct the for-

mer mistake. These set in a contrary direction to the general motion of the sea westward; and that so strongly that a passage, which, with the current, is made in two days, is with difficulty performed in six weeks against it. However, they do not extend above twenty leagues from the coast; and ships going to the East-Indies take care not to come within the sphere of their action. At Sumatra, the currents, which are extremely rapid, run from south to north: there are also strong currents between Madagascar and the Cape of Good Hope. On the western coasts of America, the current always runs from the south to the north, where a south wind continually blowing, most probably occasions this phenomenon. But the currents that are most remarkable, are those continually flowing in the Mediterranean Sea, both from the ocean by the Straits of Gibraltar, and at its other extremity, from the Euxine by the Archipelago. This is one of the most extraordinary appearances in nature; this large sea receiving not only the numerous rivers that fall into it, such as the Nile, the Rhone, and the Po, but also a very great influx from the Euxine Sea on one part, and the ocean on the other. At the same time, it is seen to return none of those waters it is thus known to receive: outlets running from it there are none; no rivers but such as bring it fresh supplies; no straits but what are constantly pouring their waters into it; it has, therefore, been the wonder of mankind in every age, how, and by what means, this vast concourse of waters are disposed of; or how this sea, which is always receiving, and never returning, is no way fuller than before. In order to account for this, some have said, that the water was reconveyed by subterraneous passages into the Red Sea. (Kircher, Mund. Subt. vol. i.) There is a story told of an Arabian caliph, who caught a dolphin in this sea, admiring the beauty of which, he let it go again, having previously marked it by a ring of iron. Some time after a dol-

phin was caught in the Red Sea, and quickly known by the ring to be the same that had been taken in the Mediterranean before. Such, however, as have not been willing to found these opinions upon a story, have attempted to account for the disposal of the waters of the Mediterranean by evaporation. For this purpose they have entered into long calculations upon the extent of its surface, and the quantity of water that would be raised from such a surface in a year. They then compute how much water runs in by its rivers and straights in that time; and find, that the quantity exhausted by evaporation greatly exceeds the quantity supplied by rivers and seas. This solution, no doubt, would be satisfactory, did not the ocean and the Euxine, evaporate as well as the Mediterranean: and as these are subject to the same drain, it must follow, that all the seas will in this respect be upon a par; and therefore, there must be some other cause for this unperceived drain, and continual supply. This seems to be satisfactorily enough accounted for by Dr. Smith, who supposes an under current running through the straits of Giberaltar to carry out as much water into the ocean, as the upper current continually carries in from it. To confirm this, he observes, that nearer home, between the north and the south foreland, the tide is known to run one way at top, and the ebb another way at bottom. This double current he also confirms by an experiment communicated to him by an able seaman, who, being with one of the king's frigates in the Baltic, found he went with his boat into the midstream, and was carried violently by the current; upon which a basket was sunk, with a large cannonball, to a certain depth of water, which gave a check to the boat's motion; as the basket sunk still lower, the boat was driven, by the force of the water below, against the upper current; and the lower the basket was let down the stronger the under current was found, and the quicker was the boat's motion against

the upper stream, which seemed not to be above four fathom deep. From hence we may readily infer, that the same cause may operate at the straits of Gibraaltar; and that while the Mediterranean seems replenishing at top, it may be emptying at bottom.

The number of the currents at sea are impossible to be recounted, nor indeed are they always known; new ones are daily producing by a variety of causes, and as quickly disappear. When a regular current is opposed by another in a narrow strait, or where the bottom of the sea is very uneven, a whirlpool is often formed. These were formerly considered as the most formidable obstructions to navigation; and the ancient poets and historians speak of them with terror; they are described as swallowing up ships, and dashing them against the rocks at the bottom: apprehension did not fail to add imaginary terrors to the description, and placed at the centre of the whirlpool a dreadful den, fraught with monsters whose howling served to add new horrors to the dashings of the deep. Mankind at present, however, view these eddies of the sea with very little apprehension; and some have wondered how the ancients could have so much overcharged their descriptions. But all this is very naturally accounted for. In those times, when navigation was in its infancy, and the slightest concussion of the waves generally sent the poor adventurer to the bottom, it is not to be wondered at that he was terrified at the violent agitations in one of these. When his little ship, but ill-fitted for opposing the fury of the sea, was got within the vortex, there was then no possibily of ever returning. To add to the fatality, they were always near the shore; and along the shore was the only place where this ill-provided mariner durst venture to sail. These were, therefore, dreadful impediments to his navigation; for if he attempted to pass between them and the shore, he was sometimes sucked in by the eddy; and if he attempted to avoid them

out at sea, he was often sunk by the storm. But in our time, and in our present improved state of navigation, Charybdis and the Euripus, with all the other irregular currents of the Mediterranean, are no longer formidable. Mr. Addison, not attending to this train of thinking, upon passing through the Straits of Sicily, was surprised at the little there was of terror in the present appearance of Scylla and Charybdis; and seems to be of opinion, that their agitations are much diminished since the times of antiquity. In fact, from the reasons above, all the wonders of the Mediterranean Sea are described in much higher colours than they merit, to us who are acquainted with the more magnificent terrors of the ocean. The Mediterranean is one of the smoothest and most gentle seas in the world: its tides are scarce perceivable, except in the Gulf of Venice, and shipwrecks are less known there than in any other part of the world.

It is in the ocean, therefore, that these whirlpools are particularly dangerous, where the tides are violent, and the tempests fierce. To mention only one, that called the Maelstroom, upon the coasts of Norway, which is considered as the most dreadful and voracious in the world. The name it has received from the natives, signifies the navel of the sea; since they suppose that a great share of the water of the sea is sucked up and discharged by its vortex. A minute description of the internal parts is not to be expected, since none who were there ever returned to bring back information. The body of the waters that form this whirlpool, are extended in a circle above thirteen miles in circumference. (Kircher, Mund. Subt. vol. 1. p. 156.) In the midst of this stands a rock, against which the tide in its ebb is dashed with inconceivable fury. At this time it instantly swallows up all things that come within the sphere of its violence, trees, timber, and shipping. No skill in the mariner, nor strength of rowing can work an escape:

the sailor at the helm finds the ship at first go into a current opposite to his intentions; his vessel's motion, though slow in the beginning, becomes every moment more rapid; it goes round in circles still narrower and narrower, till at last it is dashed against the rocks and instantly disappears; nor is it seen again for six hours; till the tide flowing, it is vomited forth with the same violence with which it was drawn in. The noise of this dreadful vortex still farther contributes to increase its terror, which, with the dashing of the waters, and the dreadful valley, if it may be so called, caused by their circulation, makes one of the most tremendous objects in nature.

WESTMINSTER ABBEY.

WESTMINSTER ABBEY was founded by Sebert, King of the East Saxons; but being afterwards destroyed by the Danes, it was rebuilt by King Edgar in 958. King Edward the Confessor again rebuilt the church in 1065; and Pope Nicholas II. constituted it a place of inauguration of the kings of England. The monastery was surrendered by the abbot and convent to Henry VIII., who at first converted the establishment into a college of secular canons, under the government of a dean, and afterwards into a cathedral, of which the county of Middlesex (with the exception of the parish of Fulham, belonging to the Bishop of London) was the diocese. Edward VI. dissolved the see, and restored the college, which was subsequently converted by Mary to its original appropriation. Elizabeth dissolved that institution in 1560, and founded the present establishment.

The present church was principally built by Henry III. On the completion of the chapel in the first of Edward the Confessor, he resolved upon the removal of the remains of the saints into the new shrine in the chapel; and, says Mr. Brayley, in his excellent his-

tory of this abbey, 'in the sight of all the principal nobility and gentry of the land, who were assembled here, he and his brother Richard carried the chest containing St. Edward's remains upon their shoulders to the new shrine, wherein it was deposited with vast ceremony and exultation. The Princes Edward and Edmund, together with the Earl of Warren, the Lord Philip Basset, and others of the nobility, assisted to support the chest; and we are informed by Matthew of Westminster, that on seeing it exalted, the devils were instantly cast out of two possessed persons, who had come purposely, the one from Ireland, the other from Winchester, to receive benefit on the day of St. Edward's removal!'

During the reigns of Henry III. and Edward I. the eastern part of the nave and the aisles were rebuilt, and finished in 1307. In the reigns of Edward II. Edward III. and Richard II. the great cloisters, abbot's house, and the principal monastic buildings were erected. The western parts of the nave and aisles were rebuilt by successive monarchs, between the years 1340 and 1483. The west front and the great window were built by those rival princes, Richard III. and Henry VII.; and it was the latter monarch who commenced the magnificent chapel which bears his name, and which was finished by his son and successor.

From the time of Henry VIII. to the accession of the House of Brunswick, little appears to have been done to improve the abbey; but, on the contrary, it suffered the profanation of the soldiery during the early part of the commonwealth when Sir Robert Harlow, the bigot, who was employed to demolish the venerable cross at Cheapside, broke into Henry VII.'s chapel, demolished the altar stone, and committed other outrages.

During the reigns of George I. and George II. the great west window was rebuilt, and the western towers completed; but it is to their immediate successors that Westminster Abbey is most indebted, in

the restoration of the exterior of Henry VII.'s chapel to its original beauty, after it had become so much dilapidated. This work was commenced in 1809, under the direction of Mr. James Wyatt, and has been completed at an expense of about £42,000.

On entering the great western door, the body of the church presents an impressive appearance, to which its loftiness, lightness, symmetry, and elegance contribute, although the view is somewhat disfigured by the monuments, many of which are neither good in themselves nor tastefully arranged. The church consists of a nave and two side aisles, separated by ranges of lofty columns supporting the roof, which is raised to a great elevation. The nave is separated from the choir by a screen; and the choir, in the form of a semi-octagon, was formerly surrounded by ten chapels, but there are now only seven; that which was formerly the central chapel now forms the porch of that to Henry VII.

Fees.—Admission to the nave and poets' corner from ten till dusk, 3*d.*; to the rest of the church, including Henry the Seventh's chapel, 1*s.* No gratuities received by the attendants. Prayers at a quarter before ten o'clock in the morning, and three in the afternoon.

SPONTANEOUS LACTATION.

THE following remarkable case was communicated to the *North of England Medical and Surgical Journal*, 1830, by Mr. George Semple, surgeon, Shipley Hall, near Bradford:—'Mrs. B., wife of John Breward, Simpson Green, near Idle, aged 49, has borne eight or nine children, the youngest of whom is about twelve years old. About a year ago she lost a daughter-in-law, who died of puerperal inflammation, about a fortnight after confinement of her first child. On *her* death, Mrs. B. took the charge of

the infant—a little puny, sickly baby. The child was so fretful and uneasy, so averse to taking any kind of food, and so troublesome, that Mrs. B., after several sleepless nights, was induced, by way of soothing, to permit her to take the nipple of her breast into the mouth—the child was pleased, and soon sunk to rest, and the old lady of course continued to give her this cheap and innocent sedative from time to time. In the course of from thirty to thirty-six hours she felt very unwell, her breasts became extremely painful, considerably increased in size, and soon after, to her utter astonishment, the lacteal fluid was secreted, and poured forth in the same abundance as on former occasions, after confinement of her own children. The child, now a year old, is a fine healthy, thriving girl, and only a few days ago I saw her eagerly engaged in obtaining an apparently abundant supply of healthy nourishment from the same fountain which nearly twenty years since poured forth its resources for the support of her father.

ASPHALTUM FOR ROADS.

MANY streets and roads in the metropolis are being laid down with this material. It takes its name from the lake Asphaltites, or Dead Sea, in Judea, which rises up in the nature of liquid pitch, and floats upon the surface of the water, and is condensed by degrees through the heat of the sun, and its own salt. There is also a kind of stone, or mineral matter found in Asia. This mineral has several properties; mixed with other matter it makes an excellent cement, incorruptible by air, and impenetrable by water. These two substances are mixed with a third composition in a large iron cauldron, from whence it is poured on the earth and smoothed down into the required thickness for a road, and as it dries, forms the cement above alluded to. There are no less than

three companies in London, for the express intention of paving the whole metropolis with this commodity, and it is stated in their several prospectuses, that it surpasses the present method of paving, in every point of view. One portion of Oxford-street is now undergoing the process on a small scale, by way of trial. Blackfriars bridge has also got a patch of it, which, to all appearance, answers the purpose extremely well.

STAFFA; OR, FINGAL'S CAVE.

STAFFA, about seven miles N. N. E. of Jona, and equi-distant, westward, from the shores of Mull, about one mile in length, and half a mile in breadth, is noted for the basaltic pillars which support the major part of the island, and for the magnificent spectacle afforded by the Cave of Fingal, one of the most splendid works of nature.

Notwithstanding the contiguity of this island to Mull and Jona, and the numerous vessels which navigate these seas, this wonderful island was unknown to the world in general, and even to most of the neighbouring islanders, until near the close of the last century, when Sir Joseph Banks, then on his voyage to Iceland, in consequence of information received in the Sound of Jona from some gentlemen of Mull, was induced to sail thither.

The basaltic pillars stand in natural colonnades, mostly above fifty feet high, in the south-western part, upon a firm basis of solid unshapen rock; above these, the stratum, which reaches to the soil of the island, varies in thickness, in proportion to the distribution of the surface into hill and valley. The pillars are of three, four, and more sides; but the number of those with five and six exceeds that of the others: one of seven sides, measured by Sir Joseph, was four feet five inches in diameter.

On the west side of Staffa is a small bay, the spot where boats usually land.

In proceeding along the shore, the superb cavern of Fingal appears, for such is the denomination given it by the Highlanders, to whom it is known. It is supported on each side by ranges of columns, and is roofed by the bottoms of such as have been broken away. From the interstices of the roof a yellow stalactitic matter has exuded, which precisely defines the different angles; and, varying the colour, tends to augment the elegance of its appearance. What adds to the grandeur of the scene, the whole cave is lighted from without, in such a manner, that the farthest extremity is plainly distinguished: while the air within, being constantly in motion, owing to the flux and reflux of the tides, is perfectly dry and wholesome, and entirely exempt from damp vapours, to which natural caverns are generally subject. The following are its dimensions:

	FT.	IN.
Length of the cave from the rock without.....	371	6
Do. from the pitch of the arch	250	0
Breadth of ditto at the mouth	53	7
——— ——— at the farther end.....	20	9
Height of the arch at the mouth	117	6
——— ——— at the end	70	0
Height of an outside pillar.....	39	6
Do. of one at the north-west corner.....	54	0
Depth of water at the mouth.....	18	0
——— ——— at the extremity	9	0

TEMPERATURE OF THE EARTH.

M. L. Cordier, in his essay read to the French Academy of Science, deduces from his own observations, and those of others, that the heat increases as we penetrate from the surface towards the centre of the earth, at the rate of one degree Fahrenheit in forty-five feet; that the heat of boiling water is

found in our latitudes about a mile and a half below the surface: that at the depth of sixty miles the heat must be so intense as to keep such rocks as we see at the surface in a state of fusion; that the interior of the globe, in short, consists of a molten mass, encompassed by a solid crust or shell about sixty miles in thickness!

CHALK HILLS.

The enormous chalk hills which so much abound in England, are composed of lime in chemical combination with a gas, the very same as that gas which sparkles in a glass of soda water or of bottled beer. If nature had not combined the lime with the gas, these chalk surfaces could not exist. If by any application of excessive heat this gas were driven off, the substance left would be corrosive and destructive. As soon as water touches pure lime it chemically combines with it, immense heat is evolved, and the lime breaks in pieces. Such would be the fate of Dover cliff upon the first shower, if the gas which enters into its formation were driven off.

THE TOWER OF LONDON.

Of the several fortresses in Great Britain, the most remarkable is the Tower of London, situated on the east side of that city, near the bank of the Thames. It was anciently a royal palace, and consisted of no more than what is now called the White Tower, which appears to have been first marked out by William the Conqueror, in the year 1076, and completed by his son William Rufus, who, in 1098, surrounded it with walls, and a broad deep ditch. Several succeeding princes made additions to it, and king Edward III. built the church. In the year 1638

the White Tower was rebuilt; and since the restoration of King Charles II. it has been thoroughly repaired, and a great number of additional buildings made to it. At present, besides the White Tower, here are the offices of ordnance, of the mint, of the keepers of the records, the jewel office, the Spanish armoury, the horse armoury, the new or small armoury, barracks for the soldiers, and several handsome houses; so that the Tower of London has at present more the appearance of a town than a fortress. Upon the wharf is a line of about sixty pieces of cannon, which are fired upon state holidays. On this side of the Tower the ditch is narrow, and over it is a draw-bridge; under the tower-wall, on the same side, is a water-gate, commonly called Traitor's Gate, because it has been customary to convey traitors and other state prisoners through it by water, to and from the Tower.

Parallel to the wharf, upon the walls, is a platform seventy yards in length, called the Ladies' Line, whence there is a fine prospect of the shipping, and the river Thames. From this line there is a walk round the Tower walls, on which are three batteries distinguished by the names of the Devil's Battery, the Stone Battery, and the Wooden Battery, each of which is mounted with several pieces of brass cannon.

The principal entrance to the Tower is by two gates, one within the other, on the west side, both large enough to admit carriages, and parted by a strong stone bridge, built over the ditch.

The principal officers of the Tower, are a constable, a lieutenant, and a deputy-lieutenant.

Within the outer gate is the lion tower, in which is a fine collection of wild beasts, consisting of lions and lionesses, leopards, tigers, apes, jackals, and other wild animals, together with a great variety of birds: these animals are all regularly fed, and carefully attended.

In the first story of the White Tower is an armoury

for the sea-service, containing various sorts of arms, curiously laid up, for above ten thousand seamen; and the upper stories are filled with arms and other warlike instruments, as spades, shovels, pickaxes, and chevaux-de-frise.

Near the south-west angle of the White Tower is the Spanish armoury, being the depository of the spoils of the Spanish armada, fitted out by Philip II. of Spain, to invade England in the reign of Queen Elizabeth. It consisted of 132 ships, of which scarcely 70 returned home; and 30,000 troops on board, of which 20,000 were either killed, drowned, or made prisoners in England. The trophies preserved here of this memorable victory are as follows:—A Spanish battle-axe, with a pistol in the handle, and a match-lock; the Spanish general's halbert, covered with velvet, the nails are double gilt, and on the top is the pope's head curiously engraven. An engine called the Spanish morning-star, from its figure, which is that of a star. Of this kind of engine there were many thousands on board, all with poisoned points, designed to strike at the English in case they ventured to board the Spanish fleet. Thumb-screws, of which there were several chests' full on board, intended to extort a confession from the English where their money was hid. A Spanish poll-axe, used in boarding of ships. Spanish halberts, or spears, some of which are curiously engraved, and inlaid with gold. Spanish spadas or long swords, poisoned at the points. Spanish cravats, consisting of engines of torture, made of iron, and put on board to lock the feet, arms, and heads together, of such as the Spaniards called English heretics. Bilboes, being instruments also made of iron, for yoking the English prisoners two-and-two. Spanish shot, of which there are four different sorts—spike-shot, star-shot, chain-shot, and link-shot, all admirably contrived, as well for the destruction of the masts and rigging of ships, as for sweeping the men off the decks. The banner, with

a crucifix on it, which was to have been carried before the Spanish general. An uncommon piece of arms, consisting of a pistol in a shield, contrived in such a manner that the pistol might be fired, and the body covered at the same time; it is to be fired by a match-lock, and the sight of the enemy taken through a small grate in the shield, which is pistol-proof. The Spanish ranceur, made in different forms, and intended either to kill the men on horseback, or to pull them off their horses; and on one of them is a piece of silver coin, which the Spaniards intended to have made current in England. The Spanish officers' lances, finely engraved and gilt. The common soldiers' pikes, eighteen feet in length, pointed with long sharp spikes, and shod with iron. The Spanish general's shield, which was to have been carried before him as an ensign of honour; upon which are depicted, in most curious workmanship, the labours of Hercules.

Here also are deposited several Danish and Saxon clubs, a sort of weapons which the Danes and Saxons are said to have used in their conquests of England; an instrument called King Henry VIII.'s walking-staff, with three match-lock pistols in it, and coverings to keep the charges dry; a large wooden cannon, called Policy, because, it is said, when King Henry VIII. besieged Boulogne, the roads being impassable for heavy cannon, he caused a number of these wooden ones to be made, and mounted on proper batteries before the town, as if real cannon, which so terrified the French commandant, that he gave up the place without firing a shot; and the axe with which Ann Boleyn, the mother of Queen Elizabeth, and the Earl of Essex, the favourite of Queen Elizabeth, were beheaded.

The other curiosities in this place are, a train of little cannon, neatly mounted on proper carriages, being a present from the foundry of London to King Charles I. when a child, to assist him in learning the

art of gunnery; weapons made with the blades of scythes, fixed straight to the ends of poles, and taken from the Duke of Monmouth's party at the battle of Sedgmoor, in the reign of James II.; the partisans that were carried at the funeral of King William III.; and a model of an admirable machine, the design of which was brought from Italy, by Sir Thomas Lombe, at the hazard of his life. The latter object of attention is a mill for the manufacture of silk, and was first erected in the year 1734, by Sir Thomas, at his own expense, in an island of the river Derwent, facing the town of Derby. It works three capital engines for making organzine, or thrown silk; has 26,586 wheels; and 97,746 movements, which are all worked by one water-wheel, that turns round three times in a minute. By every turn of the water-wheel, the machine twists 73,726 yards of silk thread, so that in twenty-four hours it will twist 318,496,320 yards; yet any single wheel or movement may be stopped, without impeding the rest; and the whole is governed by one regulator. This machine was thought of such importance by the legislature, that, on the expiration of the patent which Sir Thomas had obtained for the sole use of it during 14 years, the parliament granted him £14,000, as a farther recompense for the hazard he ran, and the expense he had incurred, by introducing and erecting it, on condition that he should suffer a perfect model of it to be taken, in order to secure and perpetuate the invention.

Northward of the White Tower is a noble building, called the Grand Store-house, extending 245 feet in length, and 60 in breadth. It was begun by King James II. and finished by William III. who erected that magnificent room called the New, or Small Armoury, to which there is a passage by a folding-door, adjoining to the east end of the Tower chapel, which leads to a grand staircase of easy ascent. On the left side of the uppermost landing is a workshop, in

which are constantly employed about fourteen furbishers, in cleaning, repairing, and arranging the arms contained in this place; which are so artfully disposed, that at one view may be seen arms for nearly 200,000 men, all bright and fit for service at a moment's warning. Of the disposition of these arms no adequate idea can be formed by description; and there are a thousand peculiarities in the disposition of so vast a variety which no description can reach.

Upon the ground-floor, under the small armoury, is a large room of equal dimensions with that, supported by twenty pillars, all hung round with warlike implements. This room, which contains the royal train of artillery, is 24 feet high, and is full of the most dreadful engines of destruction; besides harness for horses, men's harness, drag-ropes, trophies of standards, colours, &c.

Eastward of the White Tower, is the Horse-armoury, consisting of a plain brick building, in which are several curiosities.

Before the room-door is the figure of a grenadier in his accoutrements, as if upon duty, with his piece resting upon his arm. Within the room, on the left hand, are figures as large as life, of horse and foot, supposed to be drawn up in military order, to attend a line of kings on the other side of the room, shown in the following order: King George I. in a complete suit of armour, with a truncheon in his hand, seated on a white horse, richly caparisoned, having a fine Turkey bridle, gilt, with a globe, crescent, and star, velvet furniture laced with gold, and gold trappings. King William III. dressed in the suit of armour worn by Edward the Black Prince, at the battle of Cressy; he is mounted on a sorrel horse, whose furniture is green velvet, embroidered with silver, and holds in his right hand a flaming sword. King Charles II. dressed in armour, with a truncheon in his hand, seated on a fine horse, richly caparisoned with crimson velvet, laced with gold. King Charles I. in a

rich suit of gilt armour, curiously wrought, presented to him by the city of London, when he was Prince of Wales. James I. in a complete suit of figured armour, with a truncheon in his right hand. King Edward VI. in a curious suit of steel armour, whereon are depicted, in different compartments, a varity of scripture histories; he sits like the rest on horseback, with a truncheon in his hand. King Henry VIII. in his own armour, which is of polished steel, with the foliages gilt, and bearing a sword in his right hand. King Henry VII. who also holds a sword, and is seated on horseback in a complete suit of armour, finely wrought, and washed with silver. King Edward V. who with his brother Richard, was smothered in the Tower, by order of their uncle and guardian Richard III.: and having been proclaimed king, but never crowned, a crown is suspended over his head: he holds a lance in his right hand, and is dressed in a rich suit of armour. King Edward IV. in a bright suit of armour, with a drawn sword in his hand. King Henry VI., Henry V. and Henry IV. King Edward III. with a venerable beard, in a suit of plain bright armour, with two crowns on his sword, alluding to his having been crowned king both of England and France. King Edward I. dressed in a very curious suit of gilt armour, and in shoes of mail, with a battle-axe in his hand. And William the Conqueror, the first in the line, though the last shown, in a suit of plain armour.

The other principal curiosities in this room are a large tilting-lance of Charles Brandon, duke of Suffolk; a complete suit of armour made for King Henry VIII. when he was about eighteen years of age, rough from the hammer; a small suit of armour made for King Charles II. when he was about seven or eight years of age, with a piece of armour for his horse's head; real coats of mail, called Brigandine jackets, consisting of small bits of steel, so artfully quilted one over another, as to resist the point of a sword,

and perhaps a musket-ball, and yet so flexible, that the wearer may bend his body any way, as well as in an ordinary suit of clothes; an Indian suit of armour,* sent by the Great Mogul as a present to King Charles II; the armour of John of Gaunt, Duke of Lancaster, the son of Edward III.; and a droll figure of one William Somers, said to have been jester to King Henry VIII.

Over the door of the armoury, on the inside is a target, on which are engraved the figures of Justice, Fortune, and Fortitude; and the walls of the room are entirely lined with various pieces of armour for horses' heads and breasts, targets, and many pieces that now want a name.

About twenty yards east of the grand store-house, or new armoury, is the Jewel-office; a dark stone-room, in which the jewels of the crown are deposited. The jewels shown at this time are the following:

The imperial crown, with which it is pretended all the kings of England have been crowned, since Edward the Confessor, in 1342. It is of gold, enriched with diamonds, rubies, emeralds, sapphires, and pearls. The cap within is of purple velvet, lined with white taffety, turned up with three rows of ermine. The golden orb, or globe, put into the king's right hand, before he is crowned; and borne in his left, with the sceptre in his right, upon his return into Westminster-hall, after he is crowned at Westminster-abbey.

The globe is about six inches in diameter, edged with pearl, and enriched with precious stones. On the top is an amethyst of a violet-colour, nearly an inch and a half high, set with a rich cross of gold,

* This is reckoned a great curiosity, being made of iron quills, each about two inches long, finely japanned, and ranged in rows, one row easily slipping over another; these are bound together with silk twist, and are used in India as a defence against darts and arrows.

adorned with diamonds, pearls, and other jewels; the whole height of the ball is eleven inches.

The golden sceptre, with its cross set upon a large amethyst of great value, garnished round with table-diamonds. The top rises into a fleur-de-lis of six leaves, all enriched with precious stones; from whence issues a mound, or ball, made of the amethyst already mentioned. The sceptre with the dove, the emblem of peace, perched on the top of a small Jerusalem cross, finely ornamented with table-diamonds, and jewels of great value. St. Edward's staff, four feet seven inches and a half in length, and three inches three quarters in circumference, all of beaten gold, which is carried before the king at his coronation. The rich crown of state worn by his majesty in parliament, in which is a large emerald, seven inches round, a pearl, esteemed the finest in the world, and a ruby of inestimable value. The crown belonging to the Prince of Wales, which is carried together with the king's crown as often as his majesty goes to the parliament-house, by the keeper of the jewel-office, attended by the warders, to Whitehall, where both crowns are delivered to the officers appointed to receive them, who, with some yeomen of the guard carry them to the robing rooms adjoining to the House of Lords, where his majesty and the Prince of Wales put on their robes. The king wears his crown on his head while he sits upon the throne; but that of the prince is placed before him. As soon as the king is disrobed, the crowns are carried back to the tower, and again locked up in the jewel-office.

The crown, globe, and sceptre of Queen Mary, with the diadem she wore at her coronation with her consort William III. An ivory sceptre, with a dove on the top, made for the queen of James II., whose garniture is gold, enamelled with white. The curtana, or sword of mercy, the blade of which is thirty-two inches long, and nearly two broad, without a point, carried before the king at his coronation, between the

two swords of justice. The golden spurs, and the armillas, or bracelets for the wrists, which though very antique, are worn at the coronation. The ampulla, or eagle of gold, which is finely engraved, and holds the holy oil the kings and queens of England are anointed with; and the golden spoon that the bishops pour the oil into. The eagle and spoon are pieces of great antiquity; the former, including the pedestal, is about nine inches high, and the wings expand about seven inches; the head of the eagle screws off about the middle of the neck, which is made hollow for holding the holy oil; and when the king is anointed, the oil is poured into the spoon out of the bird's bill.

A rich salt-cellar of state, in the form of the square white tower; the workmanship is exquisitely fine: it is of gold, and used only on the king's table at the coronation. A noble silver font, doubly gilt, and elegantly wrought; in which the royal family are christened. And a large silver fountain presented to Charles II. by the town of Plymouth, curiously wrought. Here also are deposited all the crown jewels worn by the princes and princesses at coronations, and an abundance of curious old plate.

ANATOMY OF THE VOICE.

ACCORDING to Blumenbach, the voice, properly speaking, is a sound formed by means of expiration in the larynx, which is a most beautifully constructed organ, fixed upon the top of the windpipe, like a capital upon a column. It is composed of various cartilages, united in the form of a little box, and supplied with numerous muscles, that, moving together or separately, produce variations of sounds. Fulgentius, on the other hand, considers the voice to be composed of ten parts. The first four are the front teeth, so useful for the appulse of the tongue in forming sounds, without which a whistle would be

produced instead of a voice; the fifth and sixth are the lips, which he compares to cymbals striking each other; the seventh the tongue, which serves as a plectrum to articulate sounds; the eighth is the palate, the concavity of which forms the belly of the instrument; the ninth the throat, which performs the part of the flute; and the tenth the lungs, which supply the place of bellows.

THE WHALE.

THE Whale is the largest of all known animals;* those found in the Northern Ocean called black whales, are the largest, measuring from sixty to ninety feet long. They were formerly much longer, and said to be from 100 to 200 feet, but being now caught in such numbers, they are not allowed time to grow to their full size. The head is a third part of the length of the whole body: it has only two fins, one on each side of the head, from five to eight feet long. Its tail is from six to eight yards broad, and turning up at both ends in a curve: it is enabled to dash the strongest boat to pieces. It is, however, very timid, never beginning an attack, but flying at the least alarm. It swims, according to La Cepede, at the rate of thirty-three feet in a second, and it is computed that it might circumnavigate the globe in the direction of the equator, in 47 days, even allowing it to rest by night during that time. It is believed to be an extremely long lived animal. Its skin is black and smooth like

* The Natural History of Norway, by Bishop Pontoppidan, mentions a sea animal seen on that coast, called the Kraken, which appeared to be an English mile and a half in circumference; and in the sixtieth vol. of the Phil. Trans. 1769, there is an account of a sea-worm, or stoorworm, which by estimation appeared to be 150 feet long and six round.

velvet, and white underneath; on the head is a bunch, where are two nostrils, through which it breathes and spouts out the water it takes in at the mouth, with a great noise and to a considerable height. It has no teeth, but horny laminæ in its mouth fixed to the upper jaw, which is eighteen feet long, borders or whiskers, as they are called, of which the whalebone is made; they have commonly 350 of these blades on each side, but the fifty largest only are taken out, which are generally twelve feet long and twelve inches broad. The tongue consists wholly of soft fat, and will fill from five to seven barrels. The whale is covered all over with fat or blubber, from six to twelve inches deep, and under the lip it is found sometimes two feet in thickness. The fat of a whale, according to the size of the fish fills from 100 to 300 barrels, and is either turned into oil immediately, by boiling, or the pieces are barrelled up and brought home.

There are annually from 300 to 350 ships of different nations employed in fishing them, each ship having from five to seven long boats. The whales are found principally on the coast of Greenland, from the 77° to the 79° N. lat. These ships in the course of two months, sometimes kill from 1800 to 2000 whales.

The method of catching these huge animals is one of the boldest enterprises of man, situated as they are among fields of ice, some of which are more than a mile in length and of great height, and when put in motion by a tempest nothing can be more terrible. The Dutch had thirteen ships crushed to pieces by the ice in one season.

The fishery begins about the 1st of May; the ships being moored to the ice, two boats, each having on board six men (which is the complement of every boat in the fleet), are appointed from each ship to look out for the coming of the fish; these watch two hours, and are then relieved by two other boats, who watch in turn a little way from the ship and a short distance from each other. When a whale appears, the boats

in waiting rush on the animal, when the harpooner strikes him with his harpoon (a barbed dart) fixed to a handle to which a line is tied of two inches round, each boat being suppled with seven of these lines of 136 fathoms in length. As soon as the animal is struck, a signal is made to the ship, which despatches the rest of the boats to the assistance of the two first, each furnished with lines, lances, harping-irons, &c. As soon as the monster feels himself wounded, he dives swifty down into the deep, and would carry the boat along with him, if the line was not served out with sufficient rapidity and length; sometimes they run to the extent of two or three of the boat's lines, and with such velocity, that would set fire to the boat by the friction of the rope, for which reason a man stands wetting the place with a mop. After the whale runs some hundred fathoms, it returns again to the surface of the water for air, where the boats are in waiting to attack it anew with their harping-irons and lances; the latter they thrust into its body, when it plunges again into the deep. At the second immersion it appears weakened, when they attack it with spears, piercing it in the vital parts till it spouts out blood instead of water, beating the waves with its tail. The boats continue to follow it till it is quite exhausted, when they cut the lines that are fastened to the barbs and the tail off, and tow it to the ship, or sometimes to the shore, where it is cut up. The whole produce of a whale is worth, sometimes, £1000. Whilst the men are cutting off the blubber, they have spurs on their boots, with two prongs on each side of their feet to keep them from slipping.

The whale brings forth its young like a quadruped, generally one at a time, but never more than two, which it suckles; it is said that two hogsheads of milk have been drawn from one at a time. When pursued it wraps up its young in its fins close to its body and dives to the bottom of the sea. The Green-

landers eat the part about the tail and call it a delicacy. This fish lives chiefly on a white slimy substance, being a sort of animal with which these seas abound in great plenty, swimming on the surface of the water; this it imbibes by suction, preserving the substance by means of its gills, and throwing the water that comes into its mouth (with its food) out by its nostrils; its swallow being only about four inches wide, it cannot admit of gross food; likewise, by its not having teeth it is not able to masticate.

There is another species of whale in the North Sea, called Nord-leaper, equally large, but thinner in proportion than the whalebone whale. It is extremely voracious, preying chiefly on cod and herring; in the stomach of one, 300 cod were found, in that of another a ton of herrings.

There is another genus of whale called Cachalot or Spermaceti whale, found in the southern parts of the Atlantic and Pacific Oceans, and S. E. coast of Africa, inferior in size to the common whale, being only sixty or seventy feet long and sixteen round; its head is very large in proportion, and has teeth in both jaws, and its throat is much larger than that of the common whale. This fish is valuable for yielding spermaceti, which is found in a great cavity in the head of the animal; sometimes the produce of one fish will fill forty-four barrels. It likewise produces ambergris, which is found in a bag three or four feet long, in round lumps, weighing from one to twenty pounds each. This substance is nothing but the natural contents of the animal's intestines, hardened by some disease into an unusually solid state. It is believed that ambergris owes its odour to the species of cuttle-fish on which the whale feeds.

The skeleton of a whale, which is considered by naturalists to exceed in size any one ever before in the possession of man, has been brought to London for exhibition. This enormous cetaceous animal, commonly called, in English, the Greenland whale,

(or *Balæna Musculus*, in Latin), was found dead, floating on the coast of Belgium, at the distance of twelve miles from Ostend, on the 3rd of November, 1827, by a crew of fishermen: their boat being too weak of tonnage and sail, to move such an enormous mass, they hailed two other boats to their assistance, and the three together towed the whale on shore, and arrived in sight of Ostend Harbour at four o'clock next morning, being then high water. At the moment the whale was just going to enter the harbour, the cable with which it was fastened to the boats broke, and it was cast on the sands on the east side of the harbour. It was there that all the preparatory operations were made for the dissection of the animal.

The following were its Dimensions:

	FEET.
Total Length of the animal	95
Height of ditto	18
Length of the head	22
Height of the cranium	4½
Length of the vertebral column	69½
Number of the vertebræ	62
Number of the ribs, 28—length of ditto	9
Length of the fins	12½
—— of the fingers	4½
Width of the tail	22½
Length of ditto	8
	lbs.
Weight of the animal when found, 240 tons, or	480,000
—— of the skeleton only, 35 tons, or	70,000
Quantity of oil extracted from the blubber, 4000 gallons, or	40,000
Weight of the rotten flesh buried in the sand, 85 tons, or	170,000

The upper jaw was fitted up with 800 *fanons* or whalebones, and from the calculations made by Monsieur le Baron Cuvier and the Professors of the King's Gardens in Paris, this enormous animal must have lived from 900 to 1000 years—the cartilages of the fingers of the fins being quite ossified.

THE FIRST ENGLISH SHIP OF WAR.

KING HENRY the Eighth, who, from his long residence on the continent, had oppurtunities of acquiring greater skill in maritime affairs than most of his predecessors, and seems to have been the first king that thought of raising such a naval force as might be at all times sufficient for the services of the state, built a ship called the *Great Harry*, which cost him about £14,000, and which, properly speaking, was the first ship of the royal navy. She was constructed at Woolwich in 1514, and was burnt by accident, at Woolwich, Aug. 27, 1553, in the first year of Queen Anne.

THE BANK OF ENGLAND.

THE building thus entitled is an immense and very extensive stone edifice, situated a little to the north-west of Cornhill. The front is composed of a centre, eighty feet in length, of the Ionic order, on a rustic base; and of two wings, ornamented with a colonnade. The back of the building in Lothbury, is a high and heavy wall of stone, with a gateway for carriages into the bullion court.

On the east-side of the principal entrance from Threadneedle-street, is a passage leading to a spacious apartment, called the *Rotunda*, in which business in the public funds is transacted; and, branching out of this apartment, are various offices appropriated to the management of each particular stock. In each of these, under the several letters of the alphabet, are arranged the books, in which the amount of every individual's interest in such a fund is registered. The hall for the issue and exchange of bank-notes is a noble room, seventy-nine feet by forty, and contains a very fine marble statue of King William III., the founder of the bank, an admired piece of sculpture.

The Bank of England covers an extent of several acres, and is completely insulated. Its exterior is not unsuitable to the nature of the establishment, as it conveys the idea of strength and security; but having been erected at different periods, and according to different plans, by several architects, it wants uniformity of design and proportion. In the interior, a variety of alterations and improvements have been made to accommodate the vast increase of business, and of the paper-money and discounting systems. This has required considerable enlargements of the offices in every department, and has led, in the space of twenty-five years, to the necessary increase of the clerks from two hundred to eleven hundred. The capital, or Bank Stock, of this grand national establishment, has also been considerably and progressively augmented; at its incorporation, in 1694, this capital did not exceed £1,200,000; but has since risen to £14,608,500. The direction is vested in a governor, deputy-governor, and twenty-four directors, elected annually at a general court of proprietors. Thirteen of the directors, with the governor, form a court for the management of the business of the institution.

THE CAMELOPARD.

Were we to be told of an animal so tall, that a man on horseback could, with ease, ride under its belly, without stooping, we should hardly give credit to the relation; yet of this extraordinary size is the camelopard, an animal that inhabits the deserts of Africa, and the accounts of which are so well ascertained, that we cannot deny our assent to their authority. It is no easy matter to form an adequate idea of this creature's size, and the oddity of its formation. It exhibits somewhat the slender shape of the deer, or the camel, but destitute of their symmetry, or their easy power of motion. The head some-

what resembles that of the deer, with two round horns, near a foot long, and which, it is probable, it sheds as deer are found to do; its neck resembles that of a horse; its legs and feet those of the deer; but with this extraordinary difference, that the fore-legs are near twice as long as the hinder. As these creatures have been found eighteen feet high, and ten from the ground to the top of the shoulder, so allowing three feet for the depth of the body, seven feet remains, which is high enough to admit a man mounted upon a middle-sized horse. The hinder part, however, is much lower, so that when the animal appears standing, and at rest, it has somewhat the appearance of a dog sitting; and this formation of its legs gives it an awkward and laborious motion, which, though swift, must yet be tiresome. For this reason, the camelopard is an animal very rarely found, and only finds refuge in the most internal desert regions of Africa. The dimensions of a young one, as they were accurately taken by a person who examined its skin, that was brought from the Cape of Good Hope, were found to be as follow: the length of the head was one foot eight inches, the height of the fore-leg, from the ground to the top of the shoulder, was ten feet; from the shoulder to the top of the head was seven; the height of the hind leg was eight feet five inches; and from the top of the shoulder to the insertion of the tail was just seven feet long.

No animal, either from its disposition, or its formation, seems less fitted for a state of natural hostility; its horns are blunt, and even knobbed at the ends; its teeth are made entirely for vegetable pasture; its skin is beautifully speckled with white spots, upon a brownish ground; it is timorous and harmless, and, notwithstanding its great size, rather flies from, than resists the slightest enemy; it partakes very much of the nature of the camel, which it so nearly resembles; it lives entirely on vegetables,

and, when grazing, is obliged to spread its fore-legs very wide, in order to reach its pasture; its motion is a kind of pace, two legs on each side moving at the same time, whereas in other animals they move transversely. It often lies down with its belly to the earth, and, like the camel, has a callous substance upon its breast, which, when reposed, defends it from injury. This animal was known to the ancients, but has been very rarely seen in Europe. One of them was sent from the East to the Emperor of Germany, in the year 1559; but they have often been seen tame at Grand Cairo in Egypt; and, we are told, there are two there at present. When ancient Rome was in its splendour, Pompey exhibited at one time no less than ten upon the theatre. It was the barbarous pleasure of the people at that time, to see the most terrible, and the most extraordinary animals produced in combat against each other. The lion, the lynx, the tiger, the elephant, the hippopotamos, were all let loose promiscuously, and were seen to inflict indiscriminate destruction.

We believe that two or three camelopards, or giraffes, have been sent to England, as royal presents: one, a short time ago, gave birth to a young one, but it died a few days after its birth.

THE ROYAL EXCHANGE.

THE Royal Exchange was first built in 1566, at the sole expense of Sir Thomas Gresham, an eminent citizen of London. Before that time, the merchants had no public building in which to transact their business. It was first called the Bourse; but Queen Elizabeth, during whose reign it was erected, went there, in grand procession, on the 23d of January, 1570-71, and had it proclaimed 'The Royal Exchange.' Sir Thomas Gresham left the building at his death to the corporation of London and the Mer-

cers' Company, at whose joint expense it was rebuilt, after the fire of London. The cost in erecting it was £58,000., and it was first opened on September 28th, 1669. In 1820, the whole building underwent a thorough repair, when the tower over the chief entrance was rebuilt.

The ground plan of this edifice is nearly a regular quadrangle, including an open court (144 feet by 117 feet), surrounded by a broad piazza, and having a projecting arcade at its respective fronts in Cornhill and Threadneedle-Street. The south front, in Cornhill, was 210 feet in length. Here was the principal entrance, which consisted of a projecting portico, composed of a lofty archway, opening from the middle intercolumniation, of four three-quarter Corinthian columns, supporting a compass pediment; and, in the intercolumniation on each side, in the front next the street, was a niche, with statues of King Charles I. and II., in Roman habits. This building was 56 feet high; and from the centre, in this front, rose the tower, consisting of a square story, ornamented with colossal griffins supporting the city arms, and four heads of Queen Elizabeth. Above the square story was an octagon containing the clock, over which was raised a circular story surrounded by a colonnade of the Corinthian order, the whole surmounted by a dome, and terminated by a vane of gilt brass, in the shape of a grasshopper, the crest of Sir T. Gresham's arms. The inner area was paved with Turkey stones, and had a statue of Charles II., by Spiller, on a circular pedestal in the centre. A raised step, or seat, was continued round the inner wall of the piazza, which opened to the court by a series of arches, springing from columns and pilasters of the Doric order. Beneath the piazza were twenty-eight niches, two of which contained statues of Sir Thomas Gresham and Sir John Barnard. The face of the quadrangle consisted of an upper and lower story, and was embellished with statues of the kings and queens of England,

beginning with Edward I. on the north side, and ending with his late majesty on the east. Originally, shops occupied the building to the top; they were in number not less than two hundred, and filled the entire gallery round the sides of the quadrangle; but many years have elapsed since they ceased to be thus used. Lately, the upper rooms were appropriated as Lloyd's well-known subscription coffee-house, the Royal Exchange Assurance Office, and various other offices of underwriters and merchants.

The Gresham Lectures, gratuitously endowed by Sir Thomas Gresham, were given in one of the wings of the Royal Echange.

This building was destroyed by fire on the 10th of January, 1838.

THE SERPENTS OF INDIA.

AMONG the serpents of India the cobra-minelle is the smallest, and most dangerous; the bite occasions a speedy and painful death. They are of a brown colour, speckled with black and white, though at a distance not easily distinguished from the ground on which they move; and happy would it be if they confined themselves to it; but they enter the houses, and creep upon the beds and chairs; I once found four, and at another time five, in my chamber up stairs.

The cobra de capello, or hooded-snake *(coluber naja,)* called by the Indians, the *naag*, or *nagao*, is a large and beautiful serpent; but one of the most venomous of all the coluber class; its bite generally proves mortal in less than an hour. It is called the *hooded-snake*, from having a curious hood near the head, which it contracts or enlarges at pleasure; the centre of this hood is marked in black and white like a pair of spectacles, from whence it is also named the spectacle snake.

Of this genus are the dancing-snakes, which are

carried in baskets throughout Hindostan, and procure a maintenance for a set of people, who play a few simple notes on the flute, with which the snakes seem much delighted, and keep time by a graceful motion of the head; erecting about half their length from the ground, and following the music with gentle curves, like the undulating lines of a swan's neck. It is a well-attested fact, that when a house is infested with these snakes, and some others of the coluber genus, which destroy poultry and small domestic animals, as also by the larger serpents of the boa tribe, the musicians are sent for, who, by playing on a flageolet, find out their hiding-places, and charm them to destruction: for no sooner do the snakes hear the music, than they come softly from their retreat, and are easily taken. I imagine these musical snakes were known in Palestine, from the Psalmist comparing the ungodly to the deaf adder, which stoppeth her ears and refuseth to hear the voice of the charmer, charm he never so wisely.

When the music ceases the snakes appear motionless; but if not immediately covered up in the basket, the spectators are liable to fatal accidents. Among my drawings is that of a cobra de capallo, which danced for an hour on the table while I painted it; during which I frequently handled it, to observe the beauty of the spots, and especially the spectacles on the hood, not doubting but that its venemous fangs had been previously extracted. But the next morning my upper servant, who was a zealous Mussulman, came to me in great haste, and desired I would instantly retire, and praise the Almighty for my good fortune: not understanding his meaning, I told him that I had already performed my devotions, and had not so many stated prayers as the followers of his prophet. Mahomed then informed me, that while purchasing some fruit in the bazaar, he observed the man who had been with me on the preceding evening, entertaining the country people with his dancing snakes.

they, according to their usual custom, sat on the ground around him; when, either from the music stopping too suddenly, or from some other cause irritating the vicious reptile which I had so often handled, it darted at the throat of a young woman, and inflicted a wound of which she died in about half an hour. Mohamed once more repeated his advice for praise and thanksgiving to Alla, and recorded me in his calender as a lucky man.

Dr. Russell, in his valuable treatise on Indian serpents, has distinguished between the venomous and the harmless species, in the three genera of boa, coluber, and anguis: he has given an accurate description, and coloured engravings of forty-three of the most common serpents in Hindostan; with observations on the apparatus provided by nature, for preparing and instilling their poison: he mentions, that a quantity of warm Madeira wine taken internally, with an outward application of eau-de-lace on the punctures, was generally successful in curing the bite of the most venemous species; and that the medicine called the Tanjore-pill seemed to be equally efficacious. It may in general be remarked, that all serpents produce morbid symptoms nearly similar. The bite of a rattle-snake, in England, killed a dog in two minutes; the bite of the most pernicious snake in India was never observed to kill a dog in less than twenty-seven minutes.

BOA CONSTRICTOR.

One of these animals was brought to England in the Cæsar; he was a native of Borneo, and was put on board in a wooden cage, with a sliding door. Six goats were sent with him: one a month being considered a fair allowance. When he was fed, the sliding door being opened, one of the goats was thrust in, and the door shut. The poor victim, as if aware of the horrors of its situation, uttered the most piercing cries,

butting at the same time towards the serpent as in self-defence.

The snake at first scarcely noticed the animal, but at length turning its head, he fixed his deadly eye on the goat, who shook in every limb; though it still continued to butt at the serpent, who darted out his forked tongue, and raising his head a little, suddenly seized the goat by the fore-leg with his fangs, and throwing it down, encircled it in his folds, which resembled a knot, one part of the body overlaying the other. The half stifled cries of the goat soon became extinct, and it expired in his merciless grasp. The snake, however, held him a considerable time. He then slowly unfolded himself, and prepared for swallowing the goat, by placing his mouth in front of the head of the dead animal, which he lubricated with his saliva; then taking the muzzle in his mouth, sucked it in as far as the horns would allow; these opposed a little difficulty from their points, but they soon disappeared externally, though their progress was still very distinct on the outside, threatening every moment to protrude through the skin. The victim was now swallowed as far as the shoulders; and it was an astonishing sight to observe the extraordinary action of the snake's muscles when stretched to such an unnatural extent. When his head and neck had no other appearance than that of a serpent's skin, stuffed almost to bursting, still the working of the muscles were evident, and unabated; this seemed to be the effect of a contractile muscular power, assisted by two rows of strong hooked teeth. With all this he must be so formed as to be able to suspend his respiration for a time, for it is impossible to conceive that the process of breathing could be carried on while the mouth and throat were so completely stuffed and expanded by the body of the goat. The whole operation of completely gorging the animal, occupied about two hours and twenty minutes: at the end of which time the tumefaction or swelling was confined to the mid-

dle part of the body or stomach, the mouth and throat having resumed their natural size. The reptile now coiled himself up again, and laid quietly in his usual torpid state for about three weeks or a month, when his last meal appearing to be completely dissolved, he was presented with another goat, which he devoured with equal facility. Few of those who witnessed his first meal wished to be present at the second.

It is impossible to behold without the most painful sensation, the anxiety and trepidation of the harmless victim, or to observe the hideous writhings of the serpent around his prey, and not to imagine what our own case would be in the same dreadful situation.—M'Leod's *Voyage of the Alceste.*

AN IMMENSE SNAKE.

Before we left Dindagel, a circumstance occurred to an English officer, commanding a small out-station in this district, which may be considered not undeserving of record. He was early one morning taking his customary ramble, before the sun had attained a sufficient elevation in the heavens to drink up the freshness of the dews which glittered around, when, upon passing a small ruined building, his attention was suddenly arrested by the appearance of something with which his eye did not seem to be at all familar, moving in a deep recess of the ruin. He approached it cautiously, fearing, as he could not distinguish the object very clearly, that it might be a tiger or some other animal equally dangerous: upon closer inspection, he discovered it to be an immense snake, filling with its voluminous folds the whole recess. Determined at once upon its destruction, but knowing that he could do nothing single handed against a creature at once so active and so powerful, he made the best of his way to the guard-house, and ordered half a dozen soldiers to the spot, armed with their muskets, and having the bayonets fixed. They

were six strong, determined Englishmen. They made no objection to encounter so unusual an enemy; on the contrary, they were pleased at the thought of the sport, and, being formed in line, advanced steadily to the attack as soon as the word of command was given, and simultaneously transfixed the monster with their bayonets, firmly pinning it against the wall. Being so roughly disturbed from its slumbers, the enormous creature uncoiled itself in a few seconds, and such was its prodigious strength, that, with one mighty sweep of its tail, it dashed five of its assailants to the earth. The sixth, who was near the head, maintained his position, and still kept his terrific adversary against the wall, adroitly avoiding the lashings of its ponderous tail, by stooping or dodging as circumstances required, until the animal exhausted with pain and exertion, lay extended at full length upon the earth, almost motionless. By this time the five soldiers who had been struck down, having recovered their feet, wounded the vanquished snake with the butt-end of their muskets upon the extremity of the tail, where the inosculation of the vertebræ is less firm; thus disabling it so completely that it was soon dispatched. It measured upwards of fifty feet in length, and was full three feet in circumference.—*Oriental Annual.*

CAPTAIN MANBY'S LIFE-PRESERVER.

THIS ingenious apparatus, the result of this gallant officer's humane exertions to avert, or at least to mitigate the horrors of shipwreck, is as simple as its effects are admirable. Captain Manby, with a feeling that does honour to his heart, says, 'Neither the duties of my office, nor any other important pursuits, denied me the leasure, and my mind was incessantly intent on some means of relief against the occurrence of such disasters.' At length he succeeded. 'Com-

munication by a rope once achieved,' he goes on, 'it is easy to send on board by it any thing else; or the mere rope once sent on board will furnish the means for the shipwrecked person's preservation.' This he effects by throwing a shot from a mortar with a line attached to it, over the stranded vessel. Our limits will not allow us to enter into the simple, though lucid details, with which he illustrates his plan.

Captain Manby has thus provided the means of almost certain communication both by day and night with distressed vessels; as the night ball is provided with a hollow case of thick pasteboard, with a fuze and quick match, and charged with about 50 balls, and a sufficiency of powder to inflame them. The fuze is so graduated that the shell shall explode at the height of 300 yards. The balls spread a brilliant light for nearly a minute, and give a clear view of every surrounding object.

But the proudest testimony of its utility and efficacy is in the simple fact, that from the month of Feb. 1808, to Jan. 1827, it has been the means of saving from impending destruction 410 fellow-creatures, and the preservation of 58 vessels, many of them of considerable value.

THE CURIOSITIES OF DERBY.

To describe these particularly would far exceed our plan, a few therefore of the principal must suffice.

MAM TOR, OR MOTHER ROCK.

This wonder, as it is called, seems more figurative than curious; it is nothing more than that on the south side of a hill or peak of Derby, there is a steep precipice; the substance of which it is composed being constantly loosened by the rain and frost, and falling into a narrow bottom, which seems to swell; while the mountain is not sensibly diminished.

POOLE'S HOLE.

The entrance into this hole is so narrow, that you must stoop to get in; but it soon widens to a broad and lofty cavity, which extends in length upwards of a quarter of a mile. Water drops from the roof every where, and by the reflections of the candles, which the guides carry, exhibit a thousand imaginary figures, as lions, fonts, lanterns, organs, flitches of bacon, &c. At the farther end of this cavity is Mary Queen of Scots' pillar, so named after her paying this place a visit, and this is the boundary of most people's curiosity who visit this place. A stream of water runs through the middle of this cavern with a hideous noise re-echoed from all sides. On the left hand side, you see, after creeping through a passage of ten yards long on all fours, a chamber; where they say Poole, a famous robber from which the hole is named, lived.

THE PEAK.

At Castleton, we meet with another wonder called the Devil's A—e in the Peak, or Devil's cave. This curiosity is an opening, on the side of a steep mountain, nearly in the form of a gothic arch. It is upwards of forty-two feet perpendicular, and upwards of 60 broad at the bottom. This arch is formed by nature at the bottom of a rock which is eighty-seven yards high. It is checquered with a diversity of coloured stones, from which water drops and stalactites are formed. Just within this arch is a cavern of the same height with the arch, forty yards wide, and above a hundred in length; the roof of which is flattish, all of solid rock, and looks dreadful over head. As we proceed the roof descends gradually to a stream of water, which we cross in a flat-bottomed boat, and the roof here is so low as to require the passengers to lie extended in the boat; proceeding farther we cross the same stream, where the roof is higher, and still farther there is a third water that crosses the way,

and almost touches the roof of the cave, which is the extent known of this curiosity.

ELDEN HOLE.

Two miles E. from Sparrow pit, is another wonder, called Elden Hole. In the middle of a field, gently declining to the south, is this frightful chasm in the earth, (or rather in the rock,) its mouth is 20 feet over one way and 50 or 60 the other, descending perpendicularly into the earth; but how deep has never been ascertained, although various attempts have been made for that purpose. Mr. Cotton says, he let down a line 1600 yards long (nearly a mile.) The Earl of Leicester, in the time of Queen Elizabeth, hired a man to go down in a basket of stones, who was let down 300 ells (375 yards) and being pulled up was both speechless and senseless, and died within eight days of a phrensy. About the year 1780 the owner of the pasture where this hole is situated, lost several cattle, and agreed with two men to fill it up, who threw many loads of stones, but seeing no effect of their labour, ventured down it themselves, and found at the bottom a vast cavern which seemed impossible for them to fill up, and therefore desisted. A Mr. Lloyd, having received that account from one of the men, and being assured that there were no damps at the bottom, went down himself. The entrance is a chink in the direction of north and south. Mr. L. was let down by two ropes about eighty yards long. For the first twenty yards, though he descended obliquely, he could assist himself with his hands and feet; but below this the rock projected in large irregular crags, so that he found it very difficult to pass. When he had descended ten yards more, he found the rope by which he was suspended at least six yards from the perpendicular; from thence, the breadth of the chink was about three yards and the length six; the sides being very irregular and covered with moss, being besides wet and dirty. Within

fourteen yards of the bottom the rock opened on the east side, and he swung till he reached the floor of the cavern, which was at the depth of sixty-two yards from the mouth: the light, however, which came from above, was sufficient to read any kind of print. Here he found the cavern to consist of two parts; that in which he alighted was in the shape of an oven, the other, where he first began to swing, was a vast dome, and joined to the former by a small arched passage; in this passage the stones that had been thrown in at the top formed a slope, extending from a wall at the west side of the first dome almost to the bottom of the second cave, so that the farther end of the cave was twenty-five yards lower than where he alighted. The diameter of this cavern he judged to be about fifty yards, the top of which he could not trace with his eye.

THE COLISEUM AT ROME.

On approaching the majestic ruins of this vast amphitheatre, the most stupendous work of the kind antiquity can boast, a sweet and gently-moving astonishment is the first sensation which seizes the beholder; and soon afterwards the grand spectacle swims before him like a cloud. To give an adequate idea of this sublime building, is a task to which the pen is unequal: it must be seen to be duly appreciated. It is upwards of 1600 feet in circumference, and of such an elevation that it has been justly observed by a writer, Ammianus, "the human eye scarcely measures its height." Nearly the one half of the external circuit still remains, consisting of four tiers of arcades, adorned with columns of four orders, the Doric, Ionian, Corinthian, and Composite. Its extent, may, as well as its elevation, be estimated by the number of spectators it contained, amounting, according to some accounts, to eighty thousand, and agreeably to others, to one hundred thousand.

Thirty thousand captive Jews are said to have been engaged by Vespasian, whose name it occasionally bears, in the construction of this vast edifice; and they have not discredited their forefathers, the builders of Solomon's temple, by the performance. It was not finished, however, until the reign of his son Titus, who, on the day of its being opened, introduced into the arena not less than 5000, or, according to Dio Cassius, 9000 wild beasts, between whom and the primitive Christians held captive by the Romans, combats were fought. At the conclusion of this cruel spectacle, the whole place was put under water, and two fleets, named the Corcyrian and the Corinthian, represented a naval engagement. To render the vapour from such a multitude of persons less noxious, sweet-scented water, and frequently wine mixed with saffron, was showered down from a grated work above, on the heads of the spectators.

The Roman Emperors who succeeded Titus, were careful of the preservation of this superb monument; even the voluptuous Heliogabalus caused it to be repaired after a great fire. The rude Goths, who sacked the city of Rome, were contented with despoiling it of its internal ornaments, but respected the structure itself. The Christians, however, through an excess of zeal, have not been satisfied with allowing it gradually to decay. Pope Paul II. had as much of it levelled as was necessary to furnish materials for building the palace of St. Mark, and his pernicious example was followed by Cardinal Riario, in the construction of what is now called the chancery. Lastly, a portion of it was employed by Pope Paul III. in the erection of the Palace Farnese. Notwithstanding all these dilapidations, there still exists enough of it to inspire the spectator with awe. Immense masses appear fastened to and upon one another without any mortar or cement; and these alone, from their structure, are calculated for a duration of many thousands of years. Occasionally, where the

destroyers have not effectually attained their object, the half-loosened masses appear to be holden in the air by some invisible power; for the wide interstices among them leave no other support than their joints, which seem every moment as if about to yield unavoidably to the superior force of gravitation. "They will fall;" "they must fall;" "they are falling;" is, and has been the language of all beholders during the vast periods through which this stupendous edifice has thus hung together in the air.

THE GLACIERS.

Amongst the natural wonders of the Alps, the Glaciers, or valleys of ice, are most particularly deserving of attention; and these may be properly divided into the Upper and Lower Glaciers, the first covering the declivities of the mountains, and the other occupying the intermediate valleys.

The Upper Glaciers may be subdivided into those which cover the summits, and those which extend along the sides of the Alps. Those on the very summit consist chiefly of snow, hardened by the extreme cold; but the sides are incrusted with a mixture of ice and snow, by reason of the superior power of the summer sun to dissolve the snow, which afterwards congeals into ice.

The Lower Glaciers, which are by far the most considerable, extend in some places to a length of several leagues. They do not, however, communicate with each other; few of them being parallel to the central chain, but, stretching mostly in a transverse direction, their higher extremities are bordered by inaccessible rocks, and their lower ones extend into the cultivated valleys. The thickness of the ice appears to vary considerably in different parts; for M. Saussure observes, that in the Glaciers des Bois, he did not find it exceed a hundred feet, though he was credibly in-

formed, that in other places it was upwards of six hundred feet.

These prodigious masses of ice generally rest on one inclined plane, where being pushed forward by their own enormous weight, and but being weakly supported by the rocks beneath, they are intersected by many large chasms, and exhibit a fantastic appearance of walls, pyramids, &c.

The surface of the ice is rough and granulated, so that persons may walk upon it in perfect safety, except in such parts as have a steep descent, or are covered with a collection of earth and stones, which have fallen from the mountains, and is generally known by the appellation of the Moraine. Mr. Coxe, a celebrated traveller, who visited the Glacier des Bois, informs us, that its appearance, at a distance, was really tremendous, and that the design of crossing it seemed utterly impracticable. Numerous broad chasms intersect it in every direction; but when the company entered upon it, they found that courage and activity were only required to accomplish their task. Having passed the Moraine, and entered upon the great body of the Glacier, they observed an abundance of little rills, which, being produced by the thawing of the ice, on the upper parts of the Glacier, precipitated themselves into the chasms with a violent noise, increasing the body of waters formed by the melting of the interior surface, and finding an outlet under the immense arch of ice in the valley of Chamouney. "Having proceeded about an hour," says Mr. Coxe, "we were astonished with a view more magnificent than imagination can conceive; hitherto the Glaciers had scarcely answered my expectations, but now they far surpassed them. Nature had clad herself in all her terrors. Before me lay a valley of ice, twenty miles in extent, bounded by a circular Glacier of pure unbroken snow, surrounded by large conical rocks, terminating in sharp points, like the towers of an ancient fortifi-

cation; to the right rose a range of magnificent peaks, and far above the rest the magnificent summit of Mont Blanc, which appeared of such immense magnitude, that, at its presence, the circumjacent mountains, however gigantic, seemed to shrink before it, and hide their diminished heads. In half an hour we crossed the Moraine, which forms a branch of the valley, and proceeded upon a body of ice about three quarters of a mile broad. Then passing a second and third Moraine, we descended upon the last ridge of ice, which was considerably broader than the two former, and full of large chasms."

They continued to ascend the Glacier, the scene constantly increasing in awful magnificence; and after walking about five miles, they quitted the ice, and gained the top of an eminence called the Couvercle, whence they had a most interesting prospect of the surrounding scenery.—SMITH'S *Wonders.*

TRAJAN'S PILLAR.

THIS historical column was erected at Rome by the Emperor Trajan, to commemorate his victories over the Dacians, and is considered as the master-piece of the splendid monuments of art elevated by that Emperor in the Roman capital. Its celebrity is chiefly owing to the beautifully wrought bas-reliefs, containing about two thousand figures, with which it is ornamented. It stands in the middle of a square, to form which a hill, one hundred and forty feet in height, was levelled; and was intended, as appears by the inscription on its base, both as a tomb for the Emperor, and to display the height of the hill, which had thus with incredible labour been reduced to a plane surface. It was erected in the year 114 of the Christian era; and the Emperor Constantine, two centuries and a half afterwards, regarded it as the

most magnificent structure by which Rome was even at that time embellished.

This pillar is built of white marble, its base, consisting of twelve stones of an enormous size, being raised on a socle, or foot, of eight steps: withinside is a staircase illuminated by 44 windows. Its height, equalling that of the hill which has been levelled, to give place to the large square called the *Forum Romanum*, is 140 feet, being 35 feet less elevated than the Antonine column. The latter, the sculptured ornaments of which are not equally esteemed, is decorated with bas-reliefs representing the victories of Marcus Aurelius over the Marcomanni. A spiral staircase of nearly 200 steps leads to the summit of this column.

CATACOMBS AT ROME.

THE catacombs are a vast number of subterraneous galleries in the neighbourhood of Rome, that appear to have been ancient repositories of the dead; but whether originally dug by the heathens or the primitive Christians has been much disputed by the learned. Each alley or passage is about four feet broad, and six or eight feet high, and are not only carried on in a straight direction to a surprising length, but have others running off every way like so many streets of a city. On the sides of these alleys were the niches or graves where the dead bodies were deposited, lengthwise, three or four rows one over another, parallel to the alley. Each of these graves was just capable of receiving one body, and had its mouth closed with large tiles, and sometimes pieces of marble, cemented together in a curious manner. On some few of these tiles is found the name of the deceased person; but frequently a palm-tree engraven or painted. In some places, there are little grottoes or chapels hewn out of the rock, going

off from the common gallery, which have niches all round them, and are sometimes adorned with old mosaic work or painting. These seem to have been the burial places of particular families. As to the opinion of the primitive Christians digging these caves, and not only burying their martyrs there in times of prosecution, but assembling in them for the performance of divine worship, it is highly improbable; for, as it is not to be conceived how they could carry on such a vast work unknown to their persecuting governors, considering the multitude of hands that must have been employed, and the mountains of rubbish brought out of these prodigious caverns,—so likewise is it absurd to think they could hold assemblies amidst the annoyance of stench and corruption. It is, therefore, more reasonable to suppose, that the catacombs were originally the common sepulchres of the ancient Romans, and were not used after the custom of burning the dead was introduced amongst them, unless for slaves and the meaner sort of families.

THE HIPPOPOTAMOS.

THE hippopotamos is an animal as large, and not less formidable than the rhinoceros; its legs are shorter, and its head rather more bulky, than that of the animal last mentioned. We have had but few opportunities in Europe of examining this formidable creature minutely; its dimensions, however, have been pretty well ascertained by a description given us by Serenghi, an Italian surgeon, who procured one of them to be killed on the banks of the river Nile. By his account, it appears that this terrible animal, which chiefly resides in the waters of that river, is above seventeen feet long, from the extremity of the snout to the insertion of the tail; above sixteen feet in circumference round the body, and above seven feet high: the head is near four feet

long, and above nine feet in circumference. The jaws open about two feet wide, and the cutting-teeth, of which it had four in each jaw, are above a foot long.

Its feet in some measure resemble those of the elephant, and are divided into four parts. The tail is short, flat, and pointed: the hide is amazingly thick, and, though not capable of turning a musket-ball, is impenetrable to the blow of a sabre: the body is covered over with a few scattered hairs of a whitish colour. The whole figure of the animal is something between that of an ox and a hog, and its cry is something between the bellowing of the one and the grunting of the other.

This animal, however, though so terribly furnished for war, seems no way disposed to make use of its prodigious strength against an equal enemy: it chiefly resides at the bottom of the great rivers and lakes of Africa; the Nile, the Niger, and the Zara; there it leads an indolent kind of life, and seems seldom disposed for action, except when excited by the calls of hunger. Upon such occasions, three or four of them are often seen together at the bottom of a river, near some cataract, forming a kind of line, and seizing upon such fish as are forced down by the violence of the stream. In that element they pursue their prey with great swiftness and perseverance; they swim with much force, and remain at the bottom for thirty or forty minutes, without rising to take breath. They traverse the bottom of the stream, as if walking upon land, and make a terrible devastation where they find plenty of prey. But it often happens that this animal's fishy food is not supplied in sufficient abundance; it is then forced to come upon land, where it is an awkward and unwieldly stranger; it moves but slowly, and, as it seldom forsakes the margin of the river, it sinks at every step it takes; sometimes, however, it is forced, by famine, up into the higher grounds, where it commits dread-

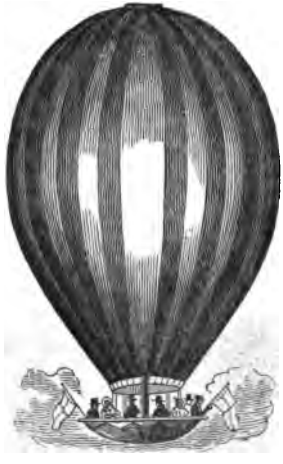
ful havoc among the plantations of the helpless natives, who see their possessions destroyed without daring to resist their invader. Their chief method is by lighting fires, striking drums, and raising a cry, to frighten it back to its favourite element; and as it is extremely timorous upon land, they generally succeed in their endeavours. But if they happen to wound, or otherwise irritate it too closely, it then becomes formidable to all that oppose it; it overturns whatever it meets, and brings forth all its strength, which it seemed not to have discovered before that dangerous occasion. It possesses the same inoffensive disposition in its favourite element that it is found to have upon land; it is never found to attack the mariners in their boats as they go up or down the stream; but should they inadvertently strike against it, or otherwise disturb its repose, there is much danger of sending them at once to the bottom. "I have seen," says a mariner, as we find it in Kampier, "one of these animals, open its jaws, and seizing a boat between its teeth, at once bite and sink it to the bottom. I have seen it, upon another occasion, place itself under one of our boats, and rising under it, overset it, with six men, who were in it; who, however, happily received no other injury." Such is the great strength of this animal; and from hence, probably, the imagination has been willing to match it in combat against others more fierce and equally formidable. The crocodile and shark have been said to engage with it, and yield an easy victory; but as the shark is only found at sea, and the hippopotamos never ventures beyond the mouth of fresh-water rivers, it is most probable that these engagements never occurred. It sometimes happens, indeed, that the princes of Africa amuse themselves with combats on their fresh-water lakes, between this and other formidable animals; but whether the rhinoceros or the crocodile are of this number, we have not been particularly informed. If this animal

be attacked on land, and finding itself incapable of vengeance from the swiftness of its enemy, it immediately returns to the river, where it plunges in head foremost, and after a short time rises to the surface, loudly bellowing, either to invite or intimidate the enemy; but though the Negroes will venture to attack the shark or the crocodile, in their natural element, and there destroy them, they are too well apprised of the force of the hippopotamos to engage it; this animal, therefore, continues the uncontrolled master of the river, and all others fly from its approach, and become an easy prey.

As the hippopotamos lives upon fish and vegetables, so it is probable the flesh of terrestrial animals may be equally grateful: the natives of Africa assert, that it has often been found to devour children and other creatures that it was able to surprise upon land; yet as it moves but slowly, almost every creature, endued with a common share of swiftness, is able to escape it; and this animal, therefore, seldom ventures from the river side but when pressed by the necessities of hunger, or of bringing forth its young.

The female always comes upon land to bring forth, and it is supposed that she seldom produces above one at a time. Upon this occasion, these animals are particularly timorous, and dread the approach of a terrestrial enemy; the instant the parent hears the slightest noise, it dashes into the stream, and the young one is seen to follow it with equal alacrity.

The young ones are said to be excellent eating; but the Negroes, to whom nothing that has life comes amiss, find an equal delicacy in the old. Dr. Pococke has seen their flesh sold in the shambles like beef; and it is said that their breast, in particular, is as delicate eating as veal. As for the rest, these animals are found in great numbers; and as they produce very fast, their flesh might supply the countries where they are found, could those barbarous regions produce more expert huntsmen. It may be



THE GREAT BALLOON.

remarked, however, that this creature, which was once in such plenty at the mouth of the Nile, is now wholly unknown in Lower Egypt, and is no where to be found in that river, except above the cataracts.

AEROSTATION.

It would appear, that it is almost, if not entirely impossible to construct a machine for the purposes of travelling through the air with any degree of certainty of arriving at a given point; and not being subject to the inconstancy of that element. Innumerable have been the plans adopted by scientific individuals to arrive at this desideratum, but hitherto with little success; and the loss of life consequent upon those attempts is awful to contemplate.

Wilkins and Lana first suggested ascent in the atmosphere by rarefied air, and Galien, of Avignon, in 1755, wrote a pamphlet on Aerostation.

The first balloon of Stephen and Joseph Montgolfier was a silk bag, containing 40 feet, which burning paper raised 70 feet. Their next was a bag of 560 feet, which rose 600 feet. Their third was 35 feet in diameter, and was capable of raising 500 pounds. It ascended before the public June 5th, 1783. On the 21st of November, Pilatree de Rosier and the Marquis d' Alandres ascended at Paris, and afterwards others with air rarefied in the car by heat.

In December, 1782, Messrs. Roberts and Charles ascended in a balloon inflated with hydrogen gas; and after them Blanchard, Morveau, the Duc d'Orleans, and others. In September, 1784, Lunardi made the first human ascent in England. In January, 1785, Blanchard and Jefferies passed from Dover to Calais, and soon after Rozier and Romain perished in an attempted voyage from Boulogne to England. In September, 1802, Garnerin descended from a parachute near London. On the 6th of September,

1804, Gay Lussac ascended at Paris, to the height of 23,400 feet. The superfices of a balloon is computed by multiplying the square of its diameter by 3.1416, or the cubic contents is the cube by 0.5236. Taking atmospheric air at 1.2 oz. to the cubic foot, we have the weight in air, and then, as carburetted hydrogen gas weighs 0.2, the weight of air multiplied by 0.2 gives the power of ascension.

The air collected by Gay Lussac, at the height of 6,636 metres, was found to have *exactly* the same proportion of constituents as on the ground. He made this voyage from Paris to near Rouen, on the 15th September, 1804, and was 5½ hours in the air, ascending 6.977 metres, 23,400 feet, or 4.4 miles, without any inconvenience, but from the dryness of the air. Even there he saw clouds considerably above him. In August, 1807, Garnerin passed 7½ hours of the night in the air, and at 18,000 feet of elevation, in an illuminated balloon, without any personal inconvenience or remarkable phenomena. He saw the sun rise, and in darkness, saw little meteors near him. In a second night ascent, in a gale of wind, he was carried above 260 miles in 7½ hours. In another night excursion, Madame Blanchard was 20 hours in the air. Sadler passed 112 miles in 90 minutes.

A Mr. Charles Green, the pretty celebrated aeronaut, Mr. Monk Mason, and a Mr. Robert Holland, made an aerial voyage in a balloon of immense magnitude, in the year 1836. This enterprising party made every preparation, provided themselves with philosophical aerostatic instruments, and took their departure in high spirits. The public anxiety was intense for a few days, as to the fate and safety of the aeronauts. . On the fourth day after their departure, intelligence reached London that the balloon, after a pleasant voyage of eighteen hours, alighted at Nassau. As might have been expected, the inhabitants were astonished at seeing such a vast machine

gradually descending amongst them; but, notwithstanding which, the greatest hospitality was evinced by the grand Prince of Nassau and his subjects. Such importance was attached to that undertaking, that Mr. Monk Mason has written a very clever work upon the subject and incidents which presented themselves during the voyage.

Some time after this, an additional novelty was presented to the studiers of aerostation, which had nearly proved fatal to Mr. Green and another gentleman, his companion. A person named Cocking had been for some years endeavouring to construct a parachute (after the plan of Mons. Garnerin,) by which he proposed to descend from the balloon at an altitude of 5000 feet! Every one endeavoured to dissuade this ill-fated man from an attempt which had proved fatal to the original projector; but all advise was useless, as he expressed the greatest confidence as to the ultimate result. Accordingly the ascent *was* made, and on arriving at the agreed height, a communication was made by Mr. Green, intreating Mr. Cocking not to carry his design into execution. The unfortunate man heeded it not, and in reply, requested Mr. Green and his companion to make preparations for lightening the balloon, and, wishing them a pleasant voyage, the parachute was severed from the balloon, by means of cutting a long rope by which it was attached. The situation of this individual was truly terrific—for, instead of the parachute opening, by the current of air, like an umbrella, it merely extended a little, collapsed and precipitated the constructor of it with awful force to the earth, from whence he was taken up a corpse! The sudden check thus given to the balloon, from being lightened of a burthen of nearly four hundred pounds, had the effect of nearly reducing Mr. Green and his companion to an unconsciousness of their own perilous situation. The immense velocity with which the ponderous machine rose in the air, pro-

duced such a sensation on the two inmates of the car, that blood rushed from their ears and eyes, and for a short space of time deprived them of both hearing and sight. Mr. Green's presence of mind, however, saved them; for he succeeded in arresting their rapid progress, and ultimately arrived on *terra firma*, in safety, but not recovered from the terror they experienced in this wonderful voyage.

The proprietors of Vauxhall Gardens, having determined to astonish the world, undertook to manufacture a balloon, under the immediate direction and inspection of Mr. Green (from whose experience they expected much, having made upwards of 260 ascents.) This beautiful and stupendous machine, represented in the engraving, was 157 feet in circumference; and the extreme height of the whole, when inflated, and with the car attached was 80 feet. It was formed of 2000 yards of crimson and white silk, imported in the raw state from Italy, expressly for the purpose; and was dyed by Messrs. Jaques, and manufactured by Messrs. Soper, of Spitalfields. The method of uniting the gores, the invention of Mr. Green, was by a cement of such a tenacious nature, that when once dry, the joint became the strongest part. It contained 70,000 cubic feet of gas. The weight of atmospheric air sufficient to inflate it, was about 5,346lbs.; and that of the same quantity of pure hydrogen gas, about 364lbs.: the machine would, consequently, if inflated with that gas, have an ascending power of 4982lbs.; and allowing 700lbs. for the weight of silk and apparatus, and 362lbs. for ballast, would be capable of ascending with 28 persons of the average weight of 140lbs. each. But Mr. Green, in his experiments in aerostation, seeing the great expense, difficulty, and inconvenience of using pure hydrogen gas, conceived the possibility of substituting carburetted hydrogen or coal gas, such as is used for illuminations; and proved the truth of his assertion by ascending with his balloon inflated

with it from the Park, on the day of the coronation of George IV. From that time the use of pure hydrogen has been almost, if not entirely, discontinued, the expense of generating it being six times greater than that of coal gas. The specific gravity of coal gas being considerably greater than that of hydrogen, it gives a balloon a much smaller ascending power; and the quality of the coal used, and the methods employed by different gas companies in its manufacture are so various, (the specific gravity having been found to vary from 340 to 790,) that it is impossible to ascertain exactly what would be the power of a balloon inflated with it. It was, however, calculated that the balloon we are writing about, would ascend with from eight to ten persons, besides ballast and apparatus; the power varying to the quality of the gas, the state of the atmosphere, and a variety of other causes. As a matter of curiosity, it may be stated that the inflated silk would sustain an atmospheric pressure of 20,433,600 lbs. or 9,122 tons! The net which entirely enveloped the silk was of hemp, and the car of basket work; the grapple or anchor, was of wrought iron, and was attached to an elastic Indian-rubber cord, from the factory of Mr. Sievier. This would prevent, in a very great measure, any sudden jerk in stopping the balloon, in rough weather, whereby so many accidents have occurred.

Among the many advantages to be gained from the enormous increase in the dimensions of this aerostatic machine, are the following:—a much greater elevation will be attained than hitherto has been, and the long-agitated question decided as to whether there are, at a great altitude, currents of air proceeding in one direction for several months together. This Mr. Green, from many observations he has made, believes to be the case at an altitude when the atmosphere is not acted on by the reflection of the sun's rays from the earth, or dense masses of clouds. Should this theory be found correct, a grand step in the progress of aerostation will be

made. The great power of the machine, even when inflated with coal gas, would enable scientific men to ascend with philosophical apparatus, for the purpose of making experiments on *Electricity*, *Pneumatics*, *Magnetism*, *&c.*, or *Astronomical* observations; which, from the small dimensions of other balloons, has been impossible; and this circumstance has caused them to be regarded by the scientific as mere objects of public exhibition. A small chamber was constructed and attached for the above purpose, in which from three to six persons could ascend, with ample room and every convenience for experimental apparatus.

The foregoing observations and description of this stupendous machine were wrote previous to the grand trial of its powers of ascension. When the day arrived for its ascent, public anxiety and curiosity were very great; and a large concourse of people assembled to witness the spectacle. It soon, however, became obvious to many that the process of inflation was not going on satisfactorily; the true cause of which we have never heard fully explained. The public excitement and impatience were growing very great, as hour after hour passed, and no signs of the balloon ascending; till at last the crowd rushed on the balloon, and totally destroyed it. Thus, those experiments which were to be made with the Great Balloon are, for the present, at an end.

A year or two ago, a French impostor introduced into this country a huge unsightly mass of canvass and wicker work, which he was pleased to denominate an "*Aerial Ship!*" The deception was soon discovered, and the wily Frenchman was obliged to quit his abode clandestinely, to escape the derision which his own cupidity had called forth. It may be as well to state that Mr. Green has given his decided opinion, in which he is joined by all other experienced aeronauts, that it is impossible to construct any machine to be guided through the air with certainty.

CORAL ISLANDS.

FEW things are more curious, or difficult to explain, than the prodigious quantity of coral formed in the sea, especially in the tropical regions. Coral is the produce of different species of vermes, and it consists chiefly of carbonate of lime. Now it is difficult to conceive where these animals procure such prodigious quantities of this substance. Sea-water, indeed, contains traces of sulphate of lime, but no other calcareous salt, as far as we know. Hence, it would appear, that these creatures must either decompose sulphate of lime, though the quantity of that salt contained in sea-water seems inadequate to supply their wants, or they must form carbonate of lime from the constituents of sea-water, in a way totally above our comprehension.

There is one consequence of this copious formation of coral in the tropical regions of considerable importance to navigation, which has been clearly pointed out by Mr. Dalrymple, and is now pretty well understood.

The winds and waves accumulate these corals in large banks, which, entangling the sand, gradually rise above the surface of the waves, and form islands. These, in process of time, probably by the agency of birds, become covered with vegetation, and frequently loaded with timber. The bottom of the islands is nothing else than a coral bank; the surface is a black soil, formed of a mixture of sand and decayed vegetable matter; the whole island is flat, long, and narrow, and extends usually in its greatest length from north to south, because almost all the winds between the tropics blow either from the east or the west. The sides of these islands frequently constitute a perpendicular wall; and the sea, at a little distance from them, is of unfathomable depth.

SHRINE OF JASPER.

In the cathedral Church of Cologne is a large purple shrine, spotted with gold, and set upon a pedestal of brass, in the middle of a square mausoleum, faced both within and without with jasper. This shrine is said to contain the remains of the three wise men, who went to Bethlehem in order to worship the Messiah, and who are said to have been removed, first to Constantinople, then to Milan, and finally to Cologne. They are generally called the three kings of Cologne: and their names, which are Gaspar, Melchior, and Balthasar, are written in purple characters upon a little grate, that is adorned with a remarkably large oriental topaz, and a profusion of pearls and precious stones. Over against the shrine are six large silver branches, perpetually illuminated with wax candles. This celebrated shrine is said to be opened every morning at nine o'clock, when the wise men are seen at full length, each having on his head an elegant crown of gold, richly garnished with jewels.—Smith's *Wonders.*

STONEHENGE.

This celebrated monument of antiquity stands in the middle of a flat area near the summit of a hill, six miles distant from Salisbury. It is enclosed by a double circular bank and ditch, nearly thirty feet broad, after crossing which an ascent of thirty yards leads to the work. The whole fabric was originally composed of two circles and two ovals. The outer circle is about 108 feet in diameter, consisting, when entire, of sixty stones, thirty uprights, and thirty imposts, of which there are now remaining twenty-four uprights only, seventeen standing, and seven down, three feet and a half asunder, and eight imposts. Eleven uprights have their five imposts on them by the

grand entrance; these stones are from thirteen to twenty feet high. The smaller circle is somewhat more than eight feet from the inside of the outer one, and consisted of forty smaller stones, the highest measuring about six feet, nineteen only of which now remain, and only eleven standing. The walk between these two circles is 300 feet in circumference. The *adytum*, or cell, is an oval formed of ten stones, from sixteen to twenty-two feet high, in pairs, and with imposts above thirty feet high, rising in height as they go round, and each pair separate, and not connected as the outer pair: the highest eight feet. Within these are nineteen other smaller single stones, of which six only are standing. At the upper end of the adytum is the altar, a large slab of blue coarse marble, twenty inches thick, sixteen feet long, and four broad: it is pressed down by the weight of the vast stones which have fallen upon it. The whole number of stones, uprights and imposts, comprehending the altar, is 140. The stones, which have by some been considered as artificial, were most probably brought from those called the *gray weathers* on Marlborough Downs, distant fifteen or sixteen miles; and if tried with a tool, appear of the same hardness, grain, and colour, generally reddish. The heads of oxen, deer, and other beasts, have been found in digging in and about Stonehenge: and in the circumjacent barrows human bones. From the plain to this structure there are three entrances, the most considerable of which is from the north-east; and at each of them were raised, on the outside of the trench, two huge stones, with two smaller parallel ones within.

Geoffroy of Monmouth, in his history of the Britons, written in the reign of King Stephen, represents this monument as having been erected at the command of Aurelius Ambrosius, the last British king, in memory of 460 Britons who were murdered by Hengist the Saxon. Polydore Virgil says that it was erected by the Britons as the sepulchral monument

of Aurelius Ambrosius; and other writers considered it to have been that of the famous British queen Boadicea. Inigo Jones is of opinion that it was a Roman temple; and this conclusion he draws from a stone sixteen feet in length, and four in breadth, placed in an exact position to the eastward, altar-fashion. By Charlton it is ascribed to the Danes, who were two years master of Wiltshire; a tin tablet, on which were some unknown characters, having been dug up in the vicinity, in the reign of Henry VIII. This tablet, which is lost, might have given some information respecting its founders. Its common name, *Stonehenge*, is Saxon, and signifies a 'stone gallows,' to which these stones, having transverse imposts, bear some resemblance. It is also called in Welch, *choir gour*, or the giant's dance.

Mr. Grose, the antiquary, is of opinion that Doctor Stukely has completely proved this structure to have been a British temple, in which the Druids officiated. He supposes it to have been the metropolitan temple of Great Britain, and translates the words *choir gour*, 'the great choir or temple.' It was customary with the Druids to place one large stone on another for a religious memorial; and these they often placed so equably, that even a breath of wind would sometimes make them vibrate. Of such stones one remains at this day in the pile of Stonehenge. The ancients distinguished stones erected with a religious view, by the name of *ambrosiæ petræ*, *amber stones*, the word *amber* implying whatever is solar and divine. According to Bryant, Stonehenge is composed of these amber stones; and hence the next town is denominated Ambresbury.

THE STATUES OF MEMNON.

FRONTING the Nile, at a considerable distance from the temple, are the colossal statues of Memnon, con-

sisting of a man and woman in a sitting posture, both of them 50 feet high, from the bases of the pedestals to the top of their heads. They are seated upon stones 15 feet high, and as many in breadth; but the back part of each stone is higher than the fore part by a foot and a half; and they are placed on plain pedestals two feet high. The statue to the north has been broken off in the middle, and been built up with five tiers of stone, but the other is of one single stone: the feet have the toes broken off, and the features are mouldered away by time. The sides of their seats are covered with hieroglyphics. On the pedestal of the statue, which has been broken, is a Greek epigram; and on their insteps and legs are several Greek and Latin inscriptions; some of these epigrams are in honour of Memnon, but most of them are the testimonies of those who have heard his sound; one of them being the famous statue of Memnon, which, at the first and second hour, it is pretended, uttered a sound, occasioned by the rays of the sun striking upon it.

THE LANTERN OF DEMOSTHENES.

In the south-west part of Athens stands a beautiful little structure, commonly called the Lantern of Demosthenes, on account of a tradition, that the orator shut himself up there, in order to pursue his studies without interruption, having first cut off one half of his beard, the more effectually to restrain himself from appearing in public. But the real design of this piece of antiquity will best appear by considering its form and ornaments.

It is a round edifice of white marble, only six feet in diameter within, and shaped so much like a lantern that it is no wonder it has obtained that name. The roof is supported by six fluted columns of the Corinthian order, 9½ feet high; and the intermediate space

is taken up with pannels of marble, of one stone from the top to the bottom. The frieze above the columns consists of one circular stone; and another entire stone forms the roof, or cupola, which is carved so as to resemble scales lying one over another, and crowned with a sort of stem, like the socket of a candlestick, or rather like a plume of feathers.

On the frieze are beautifully represented, in relievo, several of the labours and exploits of Hercules, as is judged from some of the figures being clothed with lions' skins. There is also an inscription on the frieze, which gives some reason to conjecture, that this fabric was a temple dedicated to Hercules by those who had been victors in the public games. Be this as it will, it is evidently of great antiquity, and appears to have been built above 330 years before the Christian era.

THE SUN.

THE sun was supposed, by Sir Isaac Newton, to be a solid globe of fire, so hot as to afford, at the distance of ninety-five millions of miles, the light and heat we daily experience from his beams. But as that great philosopher was enabled to make his wonderful discoveries from the information which a small telescope afforded him, subjecting his own observations, and those of all who had gone before him, to the unerring laws of mathematical demonstration—so succeeding philosophers, having glasses much exceeding his in magnifying power, together with his discoveries to begin upon, and his rules of demonstration to direct them, have consequently, since his time, much extended the science of astronomy, and have obtained such results, with respect to the nature of the sun, as warrant their widely differing from him in opinion. The theory now supported, and which seems to be well established by the discoveries of the late Sir William Herschell, is, that the sun is a solid, opaque

globe, adapted to animal life, but surrounded with a very extensive and luminous atmosphere.

The sun, when viewed through a telescope, seems, at times, far from uniformly luminous, having sometimes black spots on his surface. They first appear on the eastern limb, and cross over the disc to the western. At the end of about thirteen and a half days from their first appearance, they vanish, and are invisible for about thirteen days and a half more, when, if they are not in the mean time dissolved, they reappear in the east.

From this circumstance it has been discovered, that the sun has a rotatory motion on his own axis, and that he performs a revolution in the space of twenty-five days ten hours. Previously to the days of Herschell, these black spots amused and perplexed philosophers very much. His opinion was, that the solar sphere has mountains on its surface not less than three hundred miles high; and that, on their top, the atmosphere being by some means disturbed, becomes so thin as to permit us to have a glimpse of the sun's opaque body. It is observed of these spots, that after they disappear, the places where they were become brighter than the rest of the solar disc; that the longer they are in forming, the slower they are in dissolving; and that their sudden appearance is succeeded by an equally sudden disappearance. Two spots will sometimes unite, and, at other times, one will divide into two, which will recede from each other with considerable velocity. Their sizes are various. Some are imperceptibly small, and others as large as the whole continent of Europe, Asia, and Africa. In the year 1779, there was one visible to the naked eye, of not less than fifty thousand miles diameter. None of them ever continued longer than seventy days, while some form and dissolve in a few hours. The sun is sometimes free from them, but was never known to be so for a whole year together.

A little after sunset in the month of March, and a

little before sunrise in the month of September, a very remarkable phenomenon is seen, called the *zodiacal light*. It is supposed to be part of the sun's luminous atmosphere flying off in the plane of his equator, by reason of his great velocity, or centrifugal force. It has a pyramidal form, with the sun for its basis, and a luminous appearance resembling the *aurora borealis*.

The similarity of the sun to the other globes that compose the solar system, namely, its being diversified with hills and dales, and its rotation on its own axis, renders it more than probable that its surface is inhabited. The supposition of the solar plains being too hot for the accommodation of such living creatures as we are acquainted with, does not rest on a solid foundation. There are many arguments to prove, that the sun's rays only produce heat when they act upon a proper medium; therefore the sun's surface may be as cool as the earth's. But, should it be as hot as we may suppose from our own experience of the effects of the heat at this distance, yet there may be beings whose organs are adapted to their condition.—However, for the present we leave every one the liberty of making the sun the habitation of whatever kind of *beings* his imagination is able to produce.—*Taylor's "Key to the Knowledge of Nature."*

THE EARTH AS SEEN FROM THE MOON.

THE earth is to the moon, with respect to light, what the moon is to the earth; but it will be seen that only one half of the moon receives benefit from the earth's reflected light.

Presenting the same side continually towards the earth, half of the lunar inhabitants (as probably the moon is inhabited) will never see the earth; but will be near a fortnight in total darkness, having light neither from sun nor moon. Should a Lunarian, whose

usual place of residence is on the farther side of the moon, have his curiosity excited by the marvellous tales of travellers from this side of the lunar surface, respecting a large body, more than thirteen times the apparent size of the sun, shining almost continually in the midst of the skies; before he can be convinced of the truth by ocular demonstration, he will have to take a journey towards this side. And, should he come as far round *his* world as to that place to which this said luminary world is vertical, at the time when we have a new moon, he will see it apparently *thirteen* times as large as the full moon appears to us. Not always tenaciously keeping the same side towards him, or rising or setting, as the moon does to us, but presenting all its sides in the course of 24 hours, 50 minutes, 28 seconds of our time, and never is long itself in obscurity for almost fourteen of our days, and even when most obscured, presenting a luminous ring, occasioned by our 18 degrees of twilight; or a beautiful crescent on one side, on account of the angle made by the plane of the orbits.

Nevertheless, during the above period, or in the time of the former half of our lunations, this luminary will wane like the full moon. After about seven of its revolutions, only one half of its enlightened disc will be seen; and when about fourteen are completed, it will be at change—exhibiting only the luminous ring or crescent. After which, it will appear horned, in some respects not unlike the new one, and will wane for about some fourteen revolutions more, when it will be again circular and at full. The Lunarian's full moon is therefore our change; and their change is our full.—*Taylor's "Key to the Knowledge of Nature."*

COMETS.

COMETS, according to Sir Isaac Newton, are compact, solid, fixed, and durable bodies:—in one word, a kind of planets, which move in very oblique and eccentric elliptical orbits, every way with the greatest freedom; persevering in their motions even against the course and direction of the planets; and their tail is a very thin slender vapour emitted by the head or nucleus of the comet, ignited or heated by the sun.

From the lights which this great philosopher has thrown upon this abstruse part of astronomy, there is reason to hope that succeeding astronomers will carry it to the greatest degree of perfection. But although we are indebted to him for a true theory of the *motion* of comets, yet with respect to the formation of their *tails*, and the uses for which these great bodies are intended, his opinions have been controverted. Dr. Hamilton, in particular, in his Philosophical Essays, controverts Sir Isaac's opinion. He asserts, from a view of the phenomena of a comet, that the matter which constitutes its tail, is not an illuminated vapour, but a *self-shining substance*, which, in all positions of the comet, and whatever be the direction of its motion, whether toward or from the sun, is thrown off from its dark hemisphere, in a direction opposite to the sun, a short time before and after its perihelion or nearest approach to that luminary. He finds, moreover, in the Aurora Borealis, a matter which greatly resembles it in appearance, its situation with regard to the sun and to the body whence it flows, as well as in the nature of its substance, so far as it is known to us; for the Aurora Borealis, is likewise a rare and lucid substance, thrown off in a direction nearly opposite to the sun, from the dark hemisphere of the earth; tending toward the zenith of the spectator, or the *vertex* of the earth's shadow; rising principally from the northern

part of the earth's atmosphere, and most frequently visible while the sun is passing through the southern signs, and the earth moving from the autumnal to the vernal equinox, through that half of its orbit which is nearest to the sun; and, lastly, not intercepting, in any sensible degree, the light of the fixed stars, so that a spectator placed at a considerable distance from the earth, and shaded from the sun's light, it must appear as a tail to the earth, small, indeed, in proportion to the earth's diameter, but in its direction, situation, transparency, and lucid appearance, resembling that of a comet's. We shall conclude this wonderful subject, with the following moral reflection of an elegant writer:—

"I cannot forbear reflecting on the insignificance of human art, when set in comparison with the designs of Providence. In the pursuit of this thought, I considered a comet, or, in the language of the vulgar, a blazing star, as a sky-rocket discharged by a hand that is almighty. Many of my readers saw that in the year 1680; and, if they are not mathematicians, will be amazed to hear, that it travelled with a much greater degree of swiftness than a cannon-ball, and drew after it a tail of fire that was fourscore millions of miles in length. What an amazing thought it is to consider this stupendous body traversing the immensity of the creation with such a rapidity, and, at the same time, wheeling about in that line which the Almighty had prescribed for it! That it should move with such inconceivable fury and combustion, and, at the same time, with such an exact regularity! How spacious must the universe be, that gives such bodies as these their full play, without suffering the least disorder or confusion by it! What a glorious show are those beings entertained with, that can look into this theatre of nature, and see myriads of such tremendous objects, wandering through those immeasurable depths of ether, and running their appointed courses! Our eyes may,

hereafter, be strong enough to command this magnificent prospect, and our understandings able to find out the several uses of these great parts of the universe. In the mean time they are very proper objects for our imagination to contemplate, that we may form more extensive notions of infinite wisdom and power, and learn to think humbly of ourselves, and of all the works of human invention."—*Guardian*, No. 103.

There are three comets which have been much celebrated, *viz.*, that which appeared in 1680, just mentioned, and those of 1744 and 1759. The comet of 1680 was remarkable for its near approach to the sun; so near, that in its perihelion it was not above a third part of the diameter of that luminary from the surface thereof. Its great heat in that position was computed to be 2,000 times hotter than iron at its white heat; of course, it must have been entirely dissipated if it had been any other than a fixed and solid body. It must also have retained its heat an immense time; for a globe of iron, of an inch in diameter, exposed to the open air, scarcely loses its heat in less than an hour, but a larger globe will retain its heat longer in proportion to its diameter, because the surface at which it grows cold varies in that proportion less than the quantity of hot matter. Therefore, a globe of red-hot iron, as big as our earth, would scarcely cool in 50,000 years. The period of this comet has been calculated at 525 years: and, if this computation be accurate, it will not return to the vicinity of the earth till about the year 2225. This comet, at its greatest distance, is about 11,200 millions of miles from the sun, and its least distance is not more than 49,000 miles. In that part of its orbit which was nearest the sun, it was computed to move at the rate of 880,000 miles in an hour.

Very remarkable comets appeared in the year 1807, 1808, and 1811, but the nature and limits of this work forbids us from entering into a detailed des-

cription of them. The comet which appeared in the summer of 1809, is thus briefly described from ocular observation:

This brilliant stranger appears to have made its appearance within the limits of our optical powers rather unexpectedly; at least, we are unacquainted with any predictions of its arrival in those lower regions of space; and this is confirmed by the dissimilarity in the elements of its orbit, and those of the comets that had been previously computed. But though its visit was not only unexpected but transient, the interest it excited was general and lively. This comet appears to have been first seen at Palermo, by the celebrated astronomer Piazzi, who announced its appearance to the Duchess de Berri. It was soon afterwards seen at Paris; at both of which places the air is often more clear and suitable for astronomical observations than in England. It is said to have been first seen at both York and Leeds on the 1st of July, and when at its lowest depression below the north pole, it was only a few degrees above the horizon; but it does not appear to have been observed in the neighbourhood of the metropolis till the 3rd of that month. On that evening, however, its brilliancy was sufficient to render it visible to the naked eye, soon after the stars begun to appear in the evening. Of this the writer was himself a witness, a very few miles north of London; and thus it continued till the morning caused it to be hid from our observation. Its nucleus appeared to be well defined, and its tail extended several degrees towards the zenith, and, when seen through a good telescope, seemed to have a slightly curling divergency towards the extremity. The length of the tail was estimated by some observers at fifteen degrees. The use of the comet's huge vapoury train is, in the words of Thomson,

"Perhaps to shake
Reviving moisture on the numerous orbs

Thro' which his long ellipsis winds; perhaps
To lend new fuel to declining suns,
To light up worlds, and feed the eternal fire."

Contemplative Philosopher, Time's Telescope, &c

The following lines were written on the comet, which appeared so beautifully conspicuous in the Autumn of 1807:

Illustrious visitant. And art thou come
From paths where faintly gleams our solar ray,
Some image of the glories to convey,
Awaiting man in his eternal home!
Where neither storms approach, nor clouds, nor gloom:
But smiles invested with unfading day,
The pure expanse of ether; bright as play
The splendours, woven in Heaven's radiant loom,
Of thy soft beaming train! We think not now,
As superstitious erst, with troubled brow;
Nor view thee, with transcendent beauty endued,
As pestilence portending, famine, blood:
But rather deem an orb so fair as thou
To us and other worlds dispenses vital good.

A REMARKABLE ECLIPSE.

As total solar eclipses are by no means common, we shall give an interesting description of one by Dr. Stukely, sent to his friend, the celebrated Dr. Edmund Halley, which took place May 22nd, 1724.

According to my promise, I send you what I observed of the solar eclipse, and proposed to myself only to watch the appearances that nature would present to the naked eye upon so remarkable an occasion, and which generally are overlooked, or but rarely regarded.

I chose for my situation Haradon Hill, near Amsbury, and full east from Stonehenge Avenue. Before me lay the vast plain on which that celebrated work stands, this being the highest hill hereabouts, and nearest the middle of the shadow. About twenty miles west of me lay Clay-Hill, which rises pretty

high above the horizon, and, being near the central line of darkness, afforded sufficient notice of its approach.

Having two men in company, looking through smoked glasses, though the day was cloudy, yet we had some gleams of sunshine, we soon perceived that the eclipse was begun, when by my watch I found it half an hour after five, p. m.; and accordingly from thence the progress of it was visible, and very often to the naked eye, the thin clouds doing the office of glasses. From the time of the sun's body being half covered, there was a very conspicuous circular iris around the sun with perfect colours. On all sides, we beheld the shepherds hurrying their flocks into the folds, the darkness coming on, for they expected nothing less than a total eclipse for an hour and a quarter.

When the sun looked very sharp, like a new moon, the sky was pretty clear in that spot; but, soon after, a thicker cloud covered it, at which time the iris vanished. Clay-Hill, before-mentioned, grew very dark, together with the horizon on both sides; that is, to the north and south, and looked blue. In a few seconds, Salisbury steeple, six miles off southward, became very black; Clay-Hill quite lost, and a most gloomy night with full career came upon us. At this instant we lost sight of the sun, whose place among the clouds was hitherto sufficiently distinguishable; but now not the least trace of it was to be found, no more than if really absent: then I saw by my watch, with some difficulty, and only by help of some light from the northern quarter, that it was six hours thirty-five minutes. Just before this, the whole compass of the heavens and earth looked of a livid complexion, properly speaking, for it was black and blue. There was, likewise, in the heavens, among the clouds, much green interspersed. The whole appearance was very dreadful, and as symptoms of sickening nature. Now I perceived we were

involved in palpable and total darkness. Though it came quickly, yet I was so intent that I could perceive its steps, and feel, as it were, drop on us like a great mantle! The horses we held in our hands were very sensible of it, and drew close to us, starting with great surprise; as much as I could see of the men's faces that stood by me, they had a horrible aspect. At this instant I looked around me, not without exclamation of admiration, and could discern colours in the heavens, but the earth had lost its blue, and was wholly black. For some time, among the clouds, there were visible streaks of rays tending to the place of the sun as their centre; but immediately after the whole appearance of the earth and sky was entirely black. Of all things I ever saw in my life, or can by imagination fancy, it was a sight the most tremendous.

All the change I could perceive during the totality was, that the horizon, by degrees, drew into parts, light and dark; the northern hemisphere growing still longer, lighter, and broader—and the two opposite dark parts uniting into one, and swallowing up the southern enlightened part.

At length, upon the first lucid point appearing in the heavens where the sun was, I could distinguish pretty plainly a rim of light running alongside of us a good while together, or sweeping by our elbows west to east. Just then, having good reason to suppose that the totality ended with us, I looked on my watch, and found it to be full three minutes and a half more. Now the hill-tops changed their black into blue again; immediately we heard the larks chirping and singing very briskly for joy of the restored luminary, after all nature had been hushed into a most profound and universal silence. The heavens and the earth now appeared like morning before sunrise, of a greyish cast, but rather more blue interspersed; and the earth, so far as the verge of the hill reached, was of a dark green or russet colour. After

about the middle of the totality, and so after the emersion of the sun, we saw Venus very plainly, but no other star. The cloudiness of the day added much to the solemnity of the eclipse, which incomparably exceeded, in my apprehension, that of 1715, which I saw very perfectly from the top of Boston steeple, in Lincolnshire, where the air was very clear. —*Time's Telescope.*

THE RAINBOW.

Refracted from yon eastern cloud,
Bestriding earth, the grand ethereal bow
Shoots up immense; and every hue unfolds
In fair proportion, running from the red
To where the violet fades into the sky.—THOMSON.

THE rainbow is a circular image of the sun, variously coloured, and is thus produced: The solar rays, entering the drops of falling rain, are refracted to their further surfaces, and thence, by one or more reflections, transmitted to the eye; at their emergence from the drop, as well as at their entrance, they suffer a refraction, by which the rays are separated into their different colours, which consequently are most beautifully exhibited to an eye properly placed to receive them.

Sometimes, (though rarely,) two, and even three rainbows are seen; the colours in the bow are thus disposed, *viz.*, violet, purple, blue, green, yellow, orange, red. After a long drought, the bow is a certain sign of rain; if after much wet, fair weather; if the green be large and bright, it is a sign of rain, but if the red be the strongest colour, then it denotes wind and rain together. If the bow breaks up all at once, there will follow serene and settled weather; if the bow be seen in the morning, small rain will follow; if at noon, settled and heavy rains; if at night, fair weather. The appearance of two or three

rainbows shews fair weather for the present, but settled and heavy rains, in two or three days' time.—*Shepherd of Banbury's Rules.*

LUNAR RAINBOWS.

THE moon sometimes exhibits the phenomena of a rainbow, by the refraction of her rays in drops of rain in the night-time. Lunar rainbows very seldom present themselves to our observation: they are extremely beautiful, though much less than those that appear in the day-time, and a yellow or rather straw-colour chiefly prevails. As they are of such rare occurrence, they cannot well be reckoned among the signs of the weather, consequently no probable rules for ascertaining the weather can be deduced from the appearance of such rainbows.—*Shepherd of Banbury's Rules.*

MISCELLANEOUS.

A GLOBULAR glass bottle was blown at Leith, in 1838, capable of holding two hogsheads. Its dimensions were 40 inches by 42. This immense vessel was the largest ever produced at any glass works.

The heat of an oven, applied to a dead human body for twelve days reduced it from 120 to 12lbs. The fluids are to the solids as eight or ten to one.

Melted wax, rosin, sulphur, &c. display no electricity while heating and hot, but much when cold; for if a spark were put to them when heated it would set fire to them.

In the Arctic regions, persons can converse at more than a mile distant, when the thermometer is below zero.

In air, sound travels from 1130 to 1142 feet per second.

In water, sound passes at the rate of 4708 feet per second.

Sound travels, in air, about 900 feet for every pulsation of a healthy person, at 75 in a minute.

A bell sounded under water, may be heard under water at 1200 feet distance. Sounds are distinct at twice the distance on water that they are on land.

In a balloon, the barking of dogs on the ground may be heard at an elevation of three or four miles. On Table Mountain, a mile above Cape Town, every noise in it, and even words may be heard distinctly.

The fire of the English, on landing in Egypt, was distinctly heard 130 miles on the sea.

Dr. Jamison says, in calm weather he heard every word of a sermon at the distance of two miles!!

Water is a better conductor of sound than air. Wood also is a powerful conductor of sound, and so is flannel or ribbon. Sound affects particles of dust in a sunbeam; cobwebs and water in musical glasses; it shakes small pieces of paper off a string in concord. Deaf persons may converse through deal rods held between the teeth, or held to the throat or breast.

Echoes are formed by elliptical surfaces, combined by surrounding surfaces, or by such of them as fall into the respective distances of the surface of an ellipse, and are therefore directed to the other focus of the ellipse. For all the distances from both foci to such surface are equal, and hence there is a concentration of sounds at those points, direct from one focus, and reflected back again from the other focus. An echo returns a monosyllable at 70 feet distance, and another syllable at every 40 feet additional. The echo of artillery is increased or created by a cloud or clouds.

Miners distinguish the substance bored by the sound; and physicians distingush the action of the heart by a listening tube. Gamblers and *pie-men* can distinguish, in tossing money, which side is undermost, though covered by the hand.

M. Kempelon, an Hungarian, lately made a speaking machine. It consisted of a reed, or glottis, or air chest, with valves, bellows for lungs, a mouth and jaws, and nostrils. It pronounced most letters perfectly, but D, K, G and T imperfectly; and even long words and sentences with great facility.

The sound of a tuning-fork may be distinctly heard at the distance of 200 yards, by connecting the stem by packthread with the ear.

There are in the British museum 250,000 books; and what renders this establishment the more desirable is, that the public can be admitted to this exhaustless source of information, three days out of every week.

Wallace, in a work on the numbers of mankind, developed the principle of increase of numbers in higher ratio than increase of food, which was adopted by Malthus. While, however, the surface of the earth is so inadequately inhabited, and there are 50,000 millions acres of land, 40,000 millions of which are capable of production, all such speculations are as idle and contemptible as the reveries of the fathers and monks in the age of St. Jerome.

The best and rarest paper is now made from bricks of dried pulp, sent from Nepaul.

By the most elaborate recent determination, distilled water is to air as 770 to 1, and mercury as 10,466 to 1.

A Mr. Toplis, civil engineer, has invented a new instrument of war. One will, it is said, destroy a large army by the gases generated by gunpowder.

Stark has found that colours possess different powers of imbibing odours. Thus black absorbs far more than white, and other colours various degrees. This opens a new field of discovery.

THE CROCODILE.

THE crocodile is an animal placed at a happy distance from the inhabitants of Europe, and formidable only in those regions where men are scarce and arts are but little known. In all the cultivated and populous parts of the world, the great animals are entirely banished or rarely seen. The appearance of such raises at once a whole country up in arms to oppose their force; and their lives generally pay the forfeit of their temerity. The crocodile, therefore, that was once so terrible along the banks of the river Nile, is now neither so large, nor its numbers so great as formerly. The arts of mankind have, through a course of ages, powerfully operated to its destruction; and though it is sometimes seen, it appears comparatively timorous and feeble.

To look for this animal in all its natural terrors, grown to an enormous size, propagated in surprising numbers, and committing unceasing devastations, we must go to the uninhabited regions of Africa and America, to those immense rivers that roll through extensive and desolate kingdoms, where arts have never penetrated, where force only makes distinction, and the most powerful animals exert their strength with confidence and security. Those that sail up the river Amazons, or the river Niger, well know how numerous and terrible those animals are in such parts of the world. In both these rivers they are found from eighteen to twenty-seven feet long, and sometimes lying as close to each other as a raft of timber upon one of our streams. There they indolently bask on the surface, no way disturbed at the approach of an enemy, since, from the repeated trials of their strength, they found none that they were not able to subdue.

Of this terrible animal there are two kinds, the crocodile, properly so called, and the cayman, or alligator. Travellers, however, have rather made

the distinction than nature; for in the general outline, and in the nature of these two animals, they are entirely the same. It would be speaking more properly to call these animals the crocodiles of the eastern and the western world; for in books of voyages they are so entirely confounded together, that there is no knowing whether the Asiatic animal be the crocodile of Asia, or the alligator of the western world. The distinctions usually made between the crocodile and alligator are these: the body of the crocodile is more slender than that of the alligator, its snout runs off tapering from the forehead like that of a greyhound; while that of the other is indented, like the nose of a lap-dog. The crocodile has a much wider swallow, and is of an ash-colour; the alligator is black, varied with white, and is thought not to be so mischievous. All these distinctions, however, are very slight, and can be reckoned little more than minute variations.

This animal grows to a great length, being sometimes found thirty feet long, from the tip of the snout to the end of the tail; its most usual length, however, is eighteen. One, which was dissected by the Jesuits at Siam, was of the latter dimensions; and as the description which is given of it, both externally and internally, is the most accurate known of this noted animal, I must beg leave to give it as I find it, though somewhat tedious. It was eighteen feet and a half, French measure, in length; of which the tail was no less than five feet and a half, and the head and neck about two feet and a half. It was four feet nine inches in circumference, where thickest. The fore-legs had the same parts and conformation as the arms of a man, both within and without. The hands, if they may be so called, had five fingers; the two last of which had no nails, and were of a conical figure. The hinder legs, including the thigh and paw, were two feet two inches long; the paws, from the joint to the extremity of the longest claws,

were above nine inches; they were divided into four toes, of which three were armed with large claws, the longest of which was an inch and a half; these toes were united by a membrane, like those of a duck, but much thicker. The head was long, and had a little rising at the top; but the rest was flat, and especially towards the extremity of the jaws. It was covered by a skin, which adhered firmly to the skull and to the jaws. The skull was rough and unequal in several places; and about the middle of the forehead there were two bony crests, about two inches high: the skull between these two crests was proof against a musket ball; for it only rendered the part a little white that it struck against. The eye was very small, in proportion to the rest of the body, and was so placed within its orbit, that the outward part when the lid was closed, was only an inch long, and the line running parallel to the opening of the jaws. It was covered with a double lid, one within and one without: that within, like the nictitating membrane in birds, was folded in the great corner of the eye, and had a motion towards the tail; but, being transparent, it covered the eye without hindering the sight. The iris was very large in proportion to the globe of the eye, and was of a yellowish gray colour. Above the eye the ear was placed, which opened from above downwards, as if it were by a kind of spring, by means of a solid, thick, cartilaginous substance. The nose was placed in the middle of the upper jaw, near an inch from its extremity, and was perfectly round and flat, being near two inches in diameter, of a black, soft, spongy substance, not unlike the nose of a dog. The jaws seemed to shut one within another; and nothing can be more false than that the animal's under jaw is without motion; it moves, like the lower jaw in all other animals, while the other is fixed to the skull, and absolutely immoveable. The animal had twenty-seven cutting teeth in the upper jaw, and fifteen in

the lower, with several void spaces between them: they were thick at the bottom and sharp at the point, being all of different sizes, except ten large hooked ones, six of which were in the lower jaw, and four in the upper. The mouth was fifteen inches in length, and eight and a half in breadth, where broadest. The distance of the two jaws, when opened as wide as they could be, was fifteen inches and a half: this is a very wide yawn, and could easily enough take in the body of a man. The colour of the body was of a dark brown on the upper part, and of a whitish citron below, with large spots of both colours on the sides. From the shoulders to the extremity of the tail the animal was covered with large scales, of a square form, disposed like parallel girdles, and fifty-two in number; but those near the tail were not so thick as the rest. The creature was covered not only with these, but all over with a coat of armour; which, however, was not proof against a musket ball, contrary to what has been commonly asserted: however, it must be confessed, that the attitude in which the animal was placed might contribute to render the skin more penetrable; for, probably, if the ball had struck obliquely against the shell, it would have flown off. Those parts of the girdles underneath the belly were of a whitish colour, and were made up of scales of divers shapes, but not so hard as those on the back.

With respect to the internal parts of the animal, the gullet was large in proportion to the mouth; and a ball of wood, as large as one's head, readily ran down and was drawn up again. The guts were but short in comparison, being not so long as the animal's body. The tongue, which some have erroneously asserted this animal was without, consisted of a thick, spongy, soft flesh, and was strongly connected to the lower jaw. The heart was of the size of a calf's, of a bright red colour, the blood passing as well from the veins to the aorta as into the lungs. There was no bladder;

but the kidneys sent the urine to be discharged by the anus. There were sixty-two joints in the back-bone, which, though very closely united, had sufficient play to enable the animal to bend like a bow to the right and the left; so that what we hear of escaping the creature by turning out of the right line, and of the animal's not being able to wheel readily after its prey, seems to be fabulous. It is most likely the crocodile can turn with ease, for the joints of its back are not stiffer than those of other animals, which we know, by experience, can wheel about very nimbly for their size.

Such is the figure and conformation of this formidable animal, that unpeoples countries, and makes the most navigable rivers desert and dangerous. They are seen, in some places, lying for whole hours, and even days, stretched in the sun, and motionless; so that one not used to them might mistake them for trunks of trees, covered with a rough and dry bark; but the mistake would soon be fatal if not prevented: for the torpid animal, at the near approach of any living thing, darts upon it with instant swiftness, and at once drags it down to the bottom. In the times of an inundation, they sometimes enter the cottages of the natives, where the dreadful visitant seizes the first animal it meets with. There have been several examples of their taking a man out of a canoe in the sight of his companions, without their being able to lend him any assistance.

The strength of every part of the crocodile is very great; and its arms, both offensive and defensive, irresistible. We have seen, from the shortness of its legs, the amazing strength of the tortoise; but what is the strength of such an animal compared to that of the crocodile, whose legs are very short, and whose size is so superior. The backbone is joined in the firmest manner; the muscles of the fore and hind legs are vigorous and strong; and its whole form calculated for force. Its teeth are sharp, numerous, and

formidable; its claws are long and tenacious; but its principal instrument of destruction is the tail; with a single blow of this it has often overturned a canoe, and seized upon the poor savage its conductor.

Though not so powerful, yet it is very terrible even upon land. The crocodile seldom, except when pressed by hunger, or with a view of depositing its eggs, leaves the water. Its usual method is to float along upon the surface, and seize whatever animals come within its reach; but when this method fails, it then goes closer to the bank. Disappointed of its fishy prey, it there waits covered up among the sedges, in patient expectation of some land animal that comes to drink; the dog, the bull, the tiger, or man himself. Nothing is to be seen of the insidious destroyer as the animal approaches, nor is its retreat discovered, till it be too late for safety. It seizes the victim, with a spring, and goes at a bound much faster than so unwieldy an animal could be thought capable of exerting; then having secured the creature with both teeth and claws, it drags it into the water, instantly sinks with it to the bottom, and, in this manner, quickly drowns it.

Sometimes it happens that the creature the crocodile has thus surprised escapes from its grasp wounded, and makes off from the river side. In such a case the tyrant pursues with all its force, and often seizes it a second time; for, though seemingly heavy, the crocodile runs with great celerity. In this manner it is seen above half a mile from the bank, in pursuit of an animal wounded beyond the power of escaping, and then dragging it back to the river-side, where it feasts in security.

It often happens, in its depredations along the bank, that the crocodile seizes on a creature as formidable as itself, and meets with a most desperate resistance. We are told of frequent combats between the crocodile and the tiger. All creatures of the tiger kind, are continually oppressed by a parching

thirst, that keeps them in the vicinity of great rivers, whither they descend to drink very frequently. It is upon these occasions that they are seized by the crocodile; and they die not unrevenged. The instant they are seized upon they turn with the greatest agility, and force their claws into the crocodile's eyes, while he plunges with his fierce antagonist into the river. There they continue to struggle for some time, till at last the tiger is drowned.

In this manner the crocodile seizes and destroys all animals, and is equally dreaded by all. There is no animal but man alone that can combat it with success. We are assured by Labat, that a Negro, with no other weapons than a knife in his right hand, and his left arm wrapped round with a cow-hide, ventures boldly to attack this animal in its own element. As soon as he approaches the crocodile, he presents his left arm, which the animal swallows most greedily; but sticking in his throat, the Negro has time to give it several stabs under the throat; and the water also getting in at the mouth, which is held involuntarily open, the creature is soon bloated up as big as a tun, and expires.

To us, who live at a distance from the rapacity of these animals, these stories appear strange, and yet most probably are true. From not having seen any thing so formidable or bold, in the circle of our own experience, we are not to determine upon the wonderful transactions in distant climates. It is probable that these, and a number of more dreadful encounters, happen every day among those forests and in those rivers where the most formidable animals are known to reside; where the elephant and the rhinoceros, the tiger and the hippopotamos, the shark and the crocodile, have frequent opportunities of meeting, and every day of renewing their engagements.

Whatever be the truth of these accounts, certain it is that crocodiles are taken by the Siamese in

great abundance. The natives of that empire seem particularly fond of the capture of all the great animals with which their country abounds. We have already seen their success in taking and taming the elephant; nor are they less powerful in exerting their dominion over the crocodile. The manner of taking it in Siam is by throwing three or four strong nets across a river, at proper distances from each other; so that if the animal breaks through the first, it may be caught by one of the rest. When it is first taken it employs the tail, which is the grand instrument of strength, with great force; but after many unsuccessful struggles, the animal's strength is at last exhausted. Then the natives approach their prisoner in boats, and pierce him with their weapons in the most tender parts, till he is weakened with the loss of blood. When he has done stirring, they begin by tying up his mouth, and, with the same cord, they fasten his head to the tail, which last they bend back like a bow. However, they are not yet perfectly secure from his fury; but, for their greater safety, they tie his fore-feet, as well as those behind, to the top of his back. These precautions are not useless: for if they were to omit them, the crocodile would soon recover strength enough to do a great deal of mischief.

The crocodile, thus brought into subjection, or bred up young, is used to divert and entertain the great men of the East. It is often managed like a horse; a curb is put into its mouth, and the rider directs it as he thinks proper. Though awkwardly formed, it does not fail to proceed with some degree of swiftness; and is thought to move as fast as some of the most unwieldy of our own animals, the hog or the cow. Some, indeed, assert that no animal could escape it but for its difficulty in turning; but to this resource we could wish none would trust who are so unhappy as to find themselves in danger.

Along the rivers of Africa this animal is sometimes

taken in the same manner as the shark. Several Europeans go together in a large boat, and throw out a piece of beef upon a hook, and strongly fortified line, which the crocodile seizing and swallowing, is drawn along, floundering and struggling until its strength is quite exhausted, when it is pierced in the belly, which is the tenderest part, and thus, after numberless wounds, is drawn ashore. In this part of the world, also, as well as Siam, the crocodile makes an object of savage pomp near the palaces of their monarchs. Philips informs us, that at Sabi, on the Slave Coast, there are two pools of water, near the royal palace, where crocodiles are bred, as we breed carp in our ponds in Europe.

We have hitherto described the crocodile in those places that are thinly inhabited; but in Egypt and other places, where the inhabitants are more numerous, it is solitary and fearful. So far from coming to attack a man, it sinks at his approach with the utmost precipitation; and, as if sensible of superior power, ever declines the engagement.

The female crocodile lays from two to three hundred eggs in a hole which she makes large enough to contain them; then covering them over with sand, she leaves them to be vivified by the sun. As soon as the young ones are hatched, and enabled to crawl to the river, all natural ties betwixt them and their parents ceases; the old ones being amongst their most determined enemies, both male and female devouring their young whenever they meet with them. These animals contain a musky substance concealed in the glands under the legs and arms.

THE ENGLISH TELEGRAPH.

Between London and Portsmouth there are twelve stations; and thirty-one between London and Plymouth, of which eight are part of the Portsmouth line

till they separate in the New Forest. Another chain, extending from London to Yarmouth, contains nineteen stations; and another from London to Deal, ten stations; making in the whole system sixty-four telegraphs. The distances average about eight miles, yet some of them extend to twelve or fourteen; and the lines are often increased by circuits, for want of commanding heights. In the Yarmouth line particularly, the chain makes a considerable detour to the northward.

After about twenty years' experience, they calculate on about two hundred days on which signals can be transmitted throughout the day; about sixty others on which they can pass only part of the day, or at particular stations; and about one hundred days in which few of the stations are visible to the others. The powers of the stations in this respect are exceedingly various. The station on Putney Heath, communicating with Chelsea, is generally rendered useless during easterly winds by the smoke of London, which fills the valley of the Thames between this spot and Chelsea hospital; or, more commonly between the shorter distance of the Admiralty and Chelsea. Dead flats are found to be universally unfavourable; and generally stations are useless nearly in the proportion of the miles of dead flat looked over. On the contrary, stations between hill and hill, looking across a valley, or series of valleys, are mostly clear, and water surfaces are found to produce fewer obscure days than land in any situation. The period least favourable of the same day is an hour or two before and after the sun's passage of the meridian, particularly on dead levels, when the play of the sun's rays on the rising exhalations renders distant vision exceedingly obscure. The tranquillity of the morning and evening are ascertained to be the most favourable hours for observation.

A message from London to Portsmouth is usually transmitted in about fifteen minutes; but, by an ex-

periment tried for the purpose, a single signal has been transmitted to Plymouth and back again *in three minutes*, which, by the Telegraph route, is at least five hundred miles. In this instance, however, notice had been given to make ready, and every captain was at his post to receive and return the signals. The progress was at the rate of one hundred and seventy miles in a minute, or three miles per second, or three seconds at each station; a rapidity truly wonderful! The English telegraph consists of a large frame, in which are placed and worked six shutters, by means of ropes pulled in the manner of bell-ropes. The number of signals produced by it is sixty-three —by which are represented the ten digits, the letters of the alphabet, many generic words, and all the numbers which can be expressed by sixty-three variations of the digits. The signals are sufficiently various to express any three or four words in twice as many changes of the shutters.

The observers at these telegraphs are not expected to keep their eye constantly at the glass, but look only every five minutes for the signal to make ready. The telescopes are Dolland's Achromatics, which possess no recommendation but their enlarged field, and their freedom from prismatic colours in that field; points of no consequence in looking through a fixed and circumscribed object. The field of the Galilean telescope is quite large enough, and having, instead of the six contained in Dolland's achromatics, but two lenses, one of which is a thin concave, it exhibits the object with greater brightness, and therefore ought to have been preferred for this purpose. It seems strange also, that, to ease the operator, it has never been contrived to exhibit the fixed spectrum on the principle of a portable camera, so that, without wearying the eye, the changes of the distant telegraph might have been exhibited on a plane surface, and seen with both eyes like the leaf of a book.

HEIGHT OF THE PRINCIPAL BUILDINGS IN EUROPE.

A Discussion having arisen on the continent respecting the height of the Cathedral at Anvers, compared with that of St. Peter's at Rome, the following are the results of the inquiry, expressed in English feet:—

The highest Pyramid of Egypt	479,27
The Cathedral of Anvers	472,66
The Cathedral of Strasburgh	466,27
Spire of St. Stephen's Church, Vienna	452,95
Spire of St. Martin's Church, Landshut	419,75
The Cupola of St. Peter's, Rome	433,76
Spire of St. Michael's, Hamburg	428,43
Spire of St. Peter's, Rome	391,13
Cathedral of St. Paul, London	361,02
Cathedral of Ulm	359,16
Cathedral of Milan	358,09
Towers delgi Asinelli, at Bologna	351,07
Dome of the Invalides, Paris	344,66
Cathedral of Magdeburg	333,58
Cupola of the Pantheon, Paris	259,03
Balustrade of Notre Dame	216,67

POMPEII.

Pompeii is situated about ten English miles from the city of Naples, and at the foot of Vesuvius. Its walls were once washed by the waves, but the sea has long since retired to some distance. The Pompeians, in the midst of their tranquil existence, on the night of the 22d August, A.D. 79, were surprised by a terrible explosion, and an irruption of smoke and ashes, which completely buried the whole city, and covered the surrounding country with dismay. After a lapse of fifteen centuries, a countryman, as he was turning up the ground, accidentally found a bronze figure.

This discovery excited the attention of the learned; and further research brought numerous productions to light. Different monarchs have since lent their aid towards uncovering the buried city, and Pompeii is again shone on by the sun, and stands amidst other cities as much a stranger as any one of its former inhabitants would be among his descendants of the present day. Such a town has not its equal in existence. Among the part which was first cleared is supposed to be the main street.

No traveller should lose an opportunity of visiting Pompeii, which exhibits, even now, one of the most interesting objects in the world: and, when first discovered,—when skeletons were seen in the houses, when lamps, candlesticks, glasses of various kinds and shapes, culinary utensils, and even the very bread of the suffocated inhabitants, were to be found; when the temples were filled with statues of the heathen divinities, and adorned with all the elegant and costly ornaments of heathen worship, what a speculation must this ill-fated city have furnished to a thinking mind!

WONDERS OF THE SPIDER.

CONSTRUCTION OF A SPIDER'S WEB.

Professor Weber, of Leipsic, states, that he watched a little spider as it was constructing its web between two trees.—The three principal points to which it was attached, formed, as usual, an equilateral triangle. The two upper threads were fixed to the trunks of the trees; but not finding a point to fix the lower upon, the spider suspended from its extremity a little pebble, by way of counterpoise: the pebble being heavier than the insect, kept the web perfectly extended.—A curious paper was lately read at the Paris Academy of Sciences on the construction

of a spider's nest in earth. This spider is a native of Corsica. The nest is in the form of a well two inches deep and six lines in width. The interior is lined with fine web, and the top is furnished with a kind of lid, with hinges, which shut when the insect is in it. This lid, which is composed of earth and web, consists of forty layers.

THE WATER SPIDER

Spins no web to catch its prey; but, nevertheless, offers one of the most singular objects of contemplation. If we possessed no other evidence that the world had been planted and created by an Intelligent Being, the habits, proceedings, and instincts of this little creature would be alone sufficient to prove the fact. As soon as it has caught its prey on the shore, it dives to the bottom of the waters, and there devours its booty. It is, therefore, an amphibious animal; although it appears more fitted to live in contact with the atmosphere than with the water. The diving-bell is a modern invention; and few facts excite our wonder more than the possibility of a man's being enabled to live and move at the bottom of the ocean. This triumph of reason over the unfriendly element, however, was anticipated by an insect—the spider in question. This creature spins some loose threads, which it attaches to the leaves of aquatic plants; it then varnishes them with a glutinous secretion, which resembles liquid glass, and is so elastic as to admit of considerable distention and contraction; it next lays a coating of this same substance over its own body, and underneath this coating introduces a bubble of air. Naturalists conjecture that it has the power of drawing this air in at the anus, from the atmosphere at the surface of the pool; but the precise mode in which it is separated from the body of the atmosphere and introduced under the pellicle covering the insect's body, has not been clearly ascertained. Thus clothed, and shining like a ball of quicksilver, it darts through

the waters to the spot in which it has fixed its habitation, and disengaging the bubble from under the pellicle, it dexterously introduces it into the web formed at the bottom. After repeatedly moving from the top to the bottom of the water, and at each journey filling its habitation with a fresh bubble of air, at length the lighter completely expels the heavier fluid, and the insect takes possession of an aërial habitation, commodious and dry, finished in the very midst of the waters. It is about the size and shape of half a pigeon's egg. From this curious chamber the spider hunts, searching sometimes the water and sometimes the land for its prey, which, when obtained, is transported to this sub-aquatic mansion, and devoured at leisure. The male as well as the female exhibits the same instincts. Early in the spring, the former seeks the mansion of the latter, and having enlarged it by the introduction of a little more air, takes up its abode with its mate. About the middle of April the eggs are laid, and, packed up in a silken cocoon in a corner of their house, are watched with incessant care by the female.

THE HUNTING SPIDERS.

There is a tribe of hunting spiders that leap like tigers on their prey; and what is more extraordinary, have the faculty of doing so sideways. One of these jumped two feet on an humble bee. They approach the object of their intended attack with the noiseless and imperceptible motion of the shadow of a sun-dial. If the fly moves, the spider moves also—backwards, forwards, or sideways, and that with so much precision as to time and distance, that the two insects appear as if bound together by some invisible chain, or actuated by the same spirit. If the fly takes wing and pitches behind the spider, the head of the latter is turned round to meet it so quickly, that the human eye is deceived, and the spider appears to be motionless. When all these manœuvres bring the fly within

its spring, the leap is made with fearful rapidity, and the prey is struck down like lightning. The redeeming trait in the history of these cruel creatures is, their affection for their young.

THE BARBARY SPIDER

Is as big as a man's thumb. This singular creature carries its children in a bag like a gipsy. During their nonage the young folks reside there altogether, coming out occasionally for recreation. In requital for this kindness on the part of the nurse, the young spiders, when they are full grown, become mortal foes to the parent, attack her with violence, and if they are conquerors, dispose of the body as a fit subject for their next meal. Then there is the American spider, covered all over with hair, which is so large as to be able to kill small birds, and afterwards devour them: and also the common spider, whose body looks like a couple of peninsulas with a little isthmus (its back) between.

Europe furnishes two instances of the existence of spiders, which may justly compete with those described by our transatlantic brethren. It is said that the sexton of the church of St. Eustace, at Paris, was surprised at very often discovering a certain lamp extinct in the morning. The oil appeared always to be regularly consumed. He sat up several nights in order to discover the cause of its mysterious disappearance. At last he saw a spider of enormous dimensions come down the chain, or cord, and drink up all the oil. A spider of vast dimensions was also seen in the year 1751, in the cathedral church of Milan. It was observed to feed on the oil. It was killed, when it weighed four pounds! and was afterwards sent to the Imperial Museum at Vienna.

EPICURES IN SPIDERS.

Notwithstanding the whole family of spiders are generally regarded with horror, there are savages

who eat them: Sparman says, that the Bashie men consider them as dainties; Labillardière asserts, that the inhabitants of New Caledonia seek for and devour large quantities of a spider nearly of an inch long, which they roast over a fire. Reaumur relates, on the authority of Mons De la Hire, that a young French lady could never resist the temptation of eating a spider, whenever she met with one in her walks. They are said to taste like nuts;—at least, this was the opinion of the celebrated Maria Schurrman, who not only ate them, but justified her taste, by saying she was born under Scorpio. Latreille informs us, that the astronomer Laland was equally fond of this offensive morsel.

BASALTIC COLUMNS.

A RANGE of basaltic columns has lately been discovered at the south side of *Cairneary-hill*, in the parish of Connor, three miles N. E. of Antrim. The columns are as regularly formed as those of the Giant's Causeway—they are in general hexagonal—they incline from the perpendicular towards the north at an angle of about 17 degrees, the columns at either side leaning towards the centre. The space of ground already opened is about 40 feet in breadth, and 14 deep; the columns appearing at present being about 12 feet in height. It is the opinion of a scientific observer, that these columns form probably part of a great whin-dye, running southward from the northern shore of Antrim, and that they will not be found to extend much beyond the width now exposed to view, either towards the east or west. This will, in some degree, soon be ascertained. In the mean time, the discovery of such regular basaltic columns so far inland may form to the geologist a subject of interesting speculation.

STEEL PENS.

THE original cost of steel pens was 70*s*., they have since been made at Birmingham at 4*s*. per gross! The quantity of steel annually used in the manufacture of pens amounts to 120 tons, each ton producing 1,900,000 pens!

EXTRAORDINARY INSTANCE OF AN OSSIFIED MAN.

IN the museum at Dublin there is the skeleton of one Clerk, a native of the city of Cork, whom they call the Ossified Man, one of the greatest curiosities in nature. It is the carcass of a man entirely ossified in his lifetime, living in that condition several years. Those that knew him before this surprising alteration, affirm he had been a young man of great strength and agility. He felt the first symptoms of this surprising change some time after he had lain all night in the fields after a debauch; till by slow degrees every part grew into a bony substance, excepting his skin, eyes, and intestines; his joints settled in such a manner that no ligament had its proper operation: he could not lie down or rise up without assistance. He had at last no bend in his body; yet, when he was placed upright, like a statue of stone, he could stand, but could not move in the least. His teeth were joined and formed into one entire bone; therefore, a hole was broken through them to convey liquid substances for his nourishment. The tongue lost its use, and his sight left him, some time before he expired.

IRRADIATION OF LIGHT.

It is a curious fact, that if the same letters of the same size precisely are painted on two boards, the one white on a black ground and the other black on a white ground, that the white letters will appear larger and be read at a greater distance than the black. This is owing to what is called the irradiation of light. It depends on this, that the impression made on the bottom of the eye by bright objects extends a little wider than the actual portion of the organ struck by the light, and invading the space occupied by the darker objects, makes the brighter appear larger than they really are.

EFFECTS OF CLIMATE.

It is worthy of remark, that the real Bantam cock—that is, the native East Indian species of that name—is not diminutive, like the little feathery creature so called in England, but a very large bird, and often tall enough to peck off a common dining table.

COMBUSTION OF THE DIAMOND.

Dr. Murray, of Edinburgh, has invented an apparatus for exhibiting this curious process. A glass globe is filled with oxygen, obtained from oxmuriate of potassa over mercury. A portion of the stem of a tobacco pipe, attached to the curved end of a wire, fastened to the cork above, carries the diamond fixed in a nidus prepared for it. The diamond is kindled by the oxhydrogen blowpipe, or a stream of oxygen, urged over the flame of a spirit-of-wine lamp, and then conveyed into the globe. When the combustion of the diamond ceases, limewater is passed over the recipient, and the weight of the carbonate of lime, formed and precipitated, indicates the quantity of diamond consumed.

GOLD AND SILVER MINES.

THE mines of La Plata, so denominated on account of the abundance of silver it contains, are chiefly situated in the provinces which were strictly considered as Peruvian, before the new partition of territory in 1778; Charcas, Tucuman, and even Buenos Ayres, being then considered as dependencies of Peru. With the exception of New Spain, the upper part of the Viceroyalty of La Plata is the richest country in silver which has yet been discovered, and contains innumerable mines both of that metal and of gold. All its northern provinces teem with mineral opulence; and those of Laricaja and Carabaya are distinguished by the production of the latter, and still nobler metal in its virgin state.

The mountain of Potosi alone produces weekly about five thousand marks of silver, that is, from thirty to forty thousand dollars—a surprising produce, when it is considered that it has been wrought since 1545, at which time it was accidentally discovered by an Indian. At the commencement it was still more abundant, and the metal was dug up in a purer state; but it is still considered as the most sure and permanent mine. The silver is often found in shoots imbedded in the earth. Six thousand Indians are sent, every eighteen months, from the provinces of the Viceroyalty, to work this mine. The expedition is called *mita;* and these Indians, having been enrolled and formed into parties, are distributed by the governor of Potosi, and receive a small daily stipend, (equal to about eighteen pence English) until the period of their labour is completed. They are thus condemned to a forced service, which is nothing less than slavery, so long as it lasts, and which the Spaniards endeavour to justify by the plea that labourers could not otherwise be procured. The mita having thus, according to them, been rendered indispensable, they observe that it is conducted with all possible

humanity; which those may believe who have never heard of the cruelties they have exercised, it may be said habitually, on the wretched Indians, since the conquest.

Lumps of pure gold and silver, called *papas*, from their resemblance to the potatoe, are often found in the sands. The poor likewise occupy themselves in *lavederos*, or in washing the sands of the rivers and rivulets, in order to find particles of the precious metals.

To compensate for the mines which are rendered useless by the irruption of water, or other accidents, rich and new ones are daily discovered. They are all found in the chains of mountains, commonly in dry and barren spots, and sometimes in the sides of the *quebredas*, or astonishing precipitous breaks in the ridges. However certain this rule may be in the vice-royalty of Buenos Ayres, it is contradicted in that of Lima, where, at three leagues distance from the Pacific Ocean, not far from Tagna, in the province of Africa, there was discovered not many years ago the famous mine of Huantajaya, in a sandy plain at a distance from the mountains, of such exuberant wealth that the pure metal was cut out with a chisel. From this mine a large specimen of virgin silver is preserved in the royal cabinet of natural history at Madrid. It attracted a considerable population, although neither water nor the common conveniences for labour could be found on the spot, nor was there any pasturage for the cattle.

In the mint of Potosi about six millions of dollars are annually coined; and the mines of the viceroyalty of La Plata, taken collectively, are reckoned to yield about sixteen millions. The new viceroyalty of Buenos Ayres contains thirty gold mines, twenty-seven silver mines, and sixteen of other metals.

The mines of Mexico, or New Spain, have been more celebrated for their riches than those of La Plata, notwithstanding which they are remarkable for the

poverty of the mineral they contain. A quintal, or one thousand six hundred ounces of silver ore, affords, at a medium, not more than three or four ounces of pure silver, about one third of what is yielded by the same quantity of mineral in Saxony. It is not, therefore, owing to the richness of the ore, but to its abundance, and the facility of working it, that the mines of New Spain are so much superior to those of Europe.

The fact of the small number of persons employed in working them, is not less contrary to the commonly received opinion on this subject. The mines of Guanaxuato, infinitely richer than those of Potosi ever were, afforded from 1796 to 1803, nearly forty millions of dollars in gold and silver, or very nearly five millions of dollars annually, being somewhat less than one fourth of the whole quantity of gold and silver from New Spain; notwithstanding which, these mines, productive as they were, did not employ more than five thousand workmen of every description. In Mexico, the labour of the mines is perfectly free, and better paid than any other kind of industry, a miner earning from five to five dollars and a half weekly, while the wages of the common labourer do not exceed a dollar and a half. The *tenateros*, or persons who carry the ore on their backs, from the spot where it is dug out of the mine, to that where it is collected in heaps, receive a sum equal to five English shillings for a day's work of six hours. Neither slaves, criminals, nor forced labourers are employed in the Mexican mines.

In consequence of the clumsy, imperfect, and expensive mode of clearing them from water, several of the richest of these mines have been overflowed and abandoned; while the want of method in the arrangement of the galleries, and the absence of lateral communications, add to the uncertainty, and greatly increase the expense of working them. Labour is not, as in the working of the European mines, abridged, nor the transport of materials facilitated. When new

works are undertaken, a due consideration is not bestowed on the preliminary arrangements; and they are always conducted on too large and expensive a scale.

More than three-fourths of the silver obtained from America is extricated from the ore by the means of quicksilver, the loss of which, in the process of amalgamation, is immense. The quantity consumed annually in New Spain alone is about sixteen thousand quintals: and, in the whole of America, about twenty-five thousand quintals are annually expended, the cost of which, in the colonies, has been estimated at one-fourth of a million sterling. The greater part of this quicksilver has been lately furnished by the mine of Almaden in Spain, and that of Istria in Carniola, the celebrated quicksilver mine of Huancavelica in Peru having greatly fallen off in its produce, since the sixteenth century, when it was highly flourishing. The prosperity of the silver mines, both in Mexico and Peru, therefore, greatly depends on the supplies of quicksilver from Spain, Germany, and Italy; for such is the abundance of the ore in those kingdoms, that the only limit to the quantity of silver obtained there, is the want of mercury for amalgamation.

In taking a general view of the riches of the other provinces of America, Mr. Humboldt, who has supplied these details, remarks that, in Peru, silver ore exists in as great abundance as in Mexico, the mines of Lauricocha being capable of yielding as great a produce as those of Guanaxuato; but that the art of mining, and the methods of separating the silver from its ore, are still more defective than in New Spain. Notwithstanding this imperfect system, the total amount of the precious metals annually furnished by America is estimated at upwards of nine millions and a half sterling—the gold being in proportion to the silver as one to forty-six From 1492 to 1803, the quantity of gold and silver extracted from the American mines has been equal in value to 5,706,700,000

dollars; of which immense sum, the portion brought into Europe, including the booty made by the conquerors of America, is estimated at 5,445,000,000, giving an average of seventeen millions and a half of dollars yearly. The annual importation being divided into six periods, appears to have been constantly augmenting, and in the following progressive ratio. From 1492 to 1500, it did not exceed 250,000 dollars. From 1500 to 1545, it amounted to three millions of dollars. From 1545 to 1600, to eleven millions. From 1600 to 1700, to sixteen millions. From 1700 to 1750, to twenty-two millions and a half. And, lastly, from 1750 to 1803, to the prodigious sum of thirty-five millions three hundred thousand dollars, nearly equal to eight millions sterling.

The first period was that of exchange with the natives, or of mere rapine. The second was distinguished by the conquest and plunder of Mexico, Peru, and New Granada, and by the opening of the first mines. The third began with the discovery of the rich mines of Potosi; and in the course of it the conquest of Chili was completed, and various mines opened in New Spain. At the commencement of the fourth period, the mines of Potosi began to be exhausted; but those of Lauricocha were discovered, and the produce of New Spain rose from two millions to five millions of dollars annually. The fifth period began with the discovery of gold in Brazil; and the sixth is distinguished by the prodigious increase of the mines of New Spain, while those of every other part of America, with the exception of the Brazils, have been constantly improving.

The Gold Mines of Brazil are very productive. Those called *general* are distant about seventy-five leagues from Rio Janeiro, which is the staple and principal outlet of the riches of the Brazilian territory. They yield to the king, annually, for his right of fifths, at least one hundred and twelve arrobas [weighing twenty-five pounds each] of gold. Their

yearly produce may, therefore, be estimated at upwards of eight hundred thousand pounds sterling; and that of the more distant mines at about one third of that sum.

The gold drawn from them cannot be carried to Rio Janeiro, without being first brought to the smelting houses established in each district, where the right of the crown is received. What belongs to private persons is remitted in bars, with their weight, number, and an impression of the royal arms. The gold is then assayed, and its standard imprinted on each bar. When these bars are carried to the mint, their value is paid to the possessor in coin, commonly in half-doubloons, each worth eight Spanish dollars. Upon each of these half-doubloons the king gains a dollar, by the alloy and right of coinage. The mint of Rio Janeiro is one of the most beautiful in existence, and is furnished with every convenience for working with the greatest celerity. As the gold arrives from the mines at the same time that the fleets arrive from Portugal, it is necessary to accelerate the operations of the mint, and the coinage proceeds with surprising swiftness.

In Africa the kingdom of Mozambic abounds in gold, which is washed down by the rivers, and forms a chief part of the commerce of the country. The kingdoms of Monomotapa and Sofala likewise furnish considerable quantities of gold; and the Portuguese who reside in the latter territory, report that it yields annually two millions of *metigals*, equal to somewhat more than a million sterling. The merchants export from Mecca, and other parts, about the same quantity of gold. The soldiers are paid in gold dust, in the state in which it is collected; and this is so pure, and of so fine a yellow, as not to be exceeded, when wrought, by any other gold beside that of Japan. Gold is likewise found on the island of Madagascar. The gold coast is so denominated from the abundance of gold found among the sands: it is

not, however, so productive as has been generally supposed, owing to the intense heats, which, in a great measure, prevent the natives from prosecuting their researches.

In Asia, the island of Japan is most productive of gold, which is found in several of its provinces, and is, in by far the greater proportion, melted from its ore. It is likewise procured by washing the sands, and a small quantity is likewise found in the ore of copper. The emperor claims a supreme jurisdiction, not only over the gold mines, but over all the mines of the empire, which are not allowed to be worked without a license from him. Two thirds of their produce belong to him, and the other third is left to the governor of the province in which the mines are situated. But the richest gold ore, and that which yields the finest gold, is dug in one of the northern provinces of the island of Niphon, a dependency of Japan, where the gold mines have been highly productive until latterly, that they have much fallen off. In the Japanese province of Tskungo, a rich gold mine, having been filled with water, was no longer worked: as it was, however, so situated, that, by cutting the rock, and making an opening beneath the mine, the water could be easily drawn off, this was attempted. At the moment of commencing the operation, so violent a storm of thunder and lightning arose, that the workmen were obliged to seek shelter elsewhere; and these superstitious people imagining that the tutelar god and protector of the spot, unwilling to have the bowels of the earth thus rifled, had raised the storm to make them sensible of his great displeasure at such an undertaking, desisted from all further attempts, through the fear of incurring his displeasure.

Thibet, a mountainous country of India, contains a great abundance of gold, which is traced in the rivers flowing from that territory into the Ganges. In Hindostan there are not any mines of gold; but

in the Irnada district, gold is collected in the river which passes Nelambur in the Mangery Talui, a Nair having the exclusive privilege of this collection, for which he pays a small annual tribute. Silver is in general rare throughout the oriental regions, and there is not any indication of this metal in India; but in Japan there are several silver mines, more particularly in the northern provinces, and the metal extracted from them is very pure and fine.

Turning to Europe, Dalmatia is said in ancient times to have produced an abundance of gold. Pliny reports that in the reign of the Emperor Nero, fifty pounds of this precious metal were daily taken from the mines of that province; and that it was found on the surface of the ground. It is added that Vibius, who was sent by Augustus to subdue the Dalmatians, obliged that hardy and warlike people to work in the mines, and to separate the gold from the ore.

Bossina, in Sclavonia, contains many mineral mountains, and has rich mines of gold and silver. The district in which the latter are found is named *Srebrarniza*, being derived from the word *srebr*, which signifies silver in all the Sclavonian dialects. Their produce resembles the native silver of Potosi, and is found combined with pure quartz, in small, thin leaves, resembling moss.

The kingdom of Norway formerly produced gold; but the expense of working the mines, and procuring the pure ore, being greater than the profit, these have been neglected. There are, however, silver mines, which are extremely valuable, and give employment to several thousands of persons. The principal of those is at Konigsberg, and was discovered in 1623, when the town was immediately built, and peopled with German miners. In 1751, forty-one shafts, and twelve veins, were wrought in this mine, and gave employment to three thousand five hundred officers, artificers, and labourers.

The silver ore is not, as was at first imagined, confined to the mountain between Konigsberg and the river Jordal, but extends its veins for several miles throughout the adjacent districts, in consequence of which new mines have been undertaken in several places, and prosperously carried on. One of the richest and most ancient of the mines, named "Old God's blessing," has sometimes, in the space of a week, yielded several hundred pounds weight of rich ore. The astonishing depth of this mine, which is not less than a hundred and eighty fathoms perpendicular, fills the mind of the beholder with amazement; and the circumference at the bottom forms a clear space of several hundreds of fathoms. Here the sight of thirty or forty piles, burning on all sides in this gloomy cavern, and continually fed to soften the stone in the prosecution of the labours, seems, according to the notions commonly entertained, an apt image of hell; and the swarms of miners, covered with soot, and bustling about in habits, according to their several employments, may well pass for so many infernal spirits; more especially when, at a given signal when the mine is to be sprung in this or that direction, they exclaim aloud: "Berg-livet, berg-livet!" Take care of your lives.

The gold mines of Cremintz lie forty miles south of the Carpathian hills; and twenty miles farther to the south, are the silver mines of Shemnitz. These are called mining towns; and the former is the principal, its rich ores being found in what is styled metallic rock. Its mines also produce a certain proportion of silver. Hungary is beside enriched by a mineral peculiar to itself, or one, at least, which has not hitherto been discovered elsewhere, namely, the opal—a gem preferred to all others by the oriental nations. The opal mines are situated at Ozerwiniza, where they are found in a hill consisting of decomposed porphyry, a few fathoms beneath the surface. Their produce is of various qualities, from the opake-

white, or semi-opal, to the utmost refulgence of the lively colours by which this noble gem is distinguished.

Transylvania and the Bannat contain numerous and valuable mines, consisting chiefly of grey gold ore, and white gold ore. The finest gold is found at Olapian, not far from Zalathna, intermixed with gravel and sand. The sands of the Rhine, on the shores near Gemerscheim and Sels, also contain gold.

The mountains of Spain were, according to ancient writers, very rich in gold and silver; and accordingly Gibbon calls that kingdom "the Peru and Mexico of the old world." He adds that "the discovery of the rich western continent by the Phenicians, and the oppression of the simple natives, who were compelled to labour in their own mines for the benefit of strangers, form an exact type of the more recent history of Spanish America." The Phenicians were simply acquainted with the sea-coasts of Spain; but avarice as well as ambition carried the arms of Rome and Carthage into the heart of the country, and almost every part of the soil was found pregnant with gold, silver, and copper. A mine near Carthagena is said to have yielded daily twenty-five thousand drachms of silver, or three hundred thousand pounds sterling a year. The provinces of Austria, Gallicia, and Lusitania, yielded twenty thousand pounds weight of gold annually: the modern Spaniards have, however, chosen rather to import the precious metals from America, than to seek them at home.

Portugal is in many parts mountainous, and these mountains contain, beside others, rich ores of silver; but the Portuguese, like the Spaniards, being supplied with metals from their transatlantic possessions, and particularly with an abundance of gold and silver from Brazil, do not work the mines in their own country. Gems of all kinds, as turquoises and hyacinths, are also found in the above mountains, together with a beautifully variegated marble, and many curious fossils.

SINGULAR DISCOVERY OF A QUICK-SILVER MINE.

THE mines of quicksilver, near Idrad, in Carniola, are perhaps the richest of their kind in Europe; and were first discovered in the year 1497, in the following singular manner:—A cooper having one evening placed a new tub under a dropping spring, in order to try if it would hold water, when he came in the morning found it so heavy that he could hardly move it. At first the superstitious notions, that are apt to possess the minds of the ignorant, made him suspect that his tub was bewitched; but at last perceiving a shining fluid at the bottom, he went to Laubatch, and showed it to an apothecary, who immediately dismissed him with a small gratuity, and bid him bring some more of the same stuff, whenever he could meet with it. This the poor cooper frequently did, being highly pleased with his good fortune, till, at length, the affair being made public, several persons formed themselves into a society, in order to search farther into the quicksilver mine. In their possession it continued, till Charles, Duke of Austria, perceiving the great importance of such a work, gave them a sum of money, as a compensation for the expenses they had been at, and took it into his own hands.

The subterraneous passages of this mine are so extensive, that it would take up several hours to go through them. The greatest perpendicular height, computing from the entrance of the shaft, is 840 feet; but as they advance horizontally under a high mountain, the depth would be much greater, if it were measured from the surface of the hill. One way of descending down the shafts is by a bucket; but as the entrance is narrow, the bucket is liable to strike against the sides, or to be stopped in the way, so that it may be easily overset. The other way of going down is that of descending by a great number

of ladders placed obliquely; but as the ladders are wet and narrow, a person must step very cautiously to prevent himself from falling. In some of the subterranean passages the heat is so intense, as to throw a man into a profuse perspiration; and formerly, in some of the shafts, the air was so extremely confined, that several miners were suffocated by a kind of igneous vapour; but by sinking the main shaft deeper, the progress of this mischief has been happily prevented. Near the main shaft is a large wheel, and an hydraulic machine to raise the water from the bottom of the mine.

Virgin mercury is prepared by nature, and is found in some of the ores of this mine, in a multitude of little drops of pure quicksilver; it is also to be met with in a kind of clay, and sometimes flows down the passages or fissures of the mine in a small continued stream, so that a man has frequently gathered in six hours thirty-six pounds of virgin mercury, which bears a higher price than common quicksilver. The rest is extracted from cinnabar, or ore of quicksilver, which is pounded, washed, and distilled in large iron retorts, whence the mercury comes over pure into a receiver. Eight hundred retorts are employed at one time in the furnaces belonging to this mine; and we judge of the vast quantities of quicksilver procured from them by the remarks of an intelligent traveller, who tells us, that he saw in the castle, above 470 tons of it in barrels, and in another place, as much ore as would take up two years to distil.

Many of the miners are afflicted with a nervous disorder, accompanied with violent tremblings, convulsive motions of the hands and legs, and frightful distortions of the face. These disorders may be chiefly attributed to the virgin mercury, which in a surprising manner insinuates itself into the bodies of the miners, so that when they go into a warm bath, or are put into a profuse sweat by steam, drops of

pure mercury have been actually known to issue through their pores. These mines are sometimes infested with rats and mice, which feed on the crumbs of bread, &c., dropped by the miners at their meals; but these animals soon fall victims to the same convulsive disorders which attack the workmen.—SMITH'S *Wonders*.

TIN MINES.

AMONG the various metals and minerals produced in England, none is more considerable than its tin, the greatest part of Europe being supplied with that article from the mines in Cornwall. The chemists look upon tin as a species of imperfect metal, generated of two different seeds, *viz.*, that of silver, and that of lead, and it is frequently found both in lead and silver mines.

How long the tin mines have been discovered or worked, cannot possibly be ascertained; but it is certain that the ancient Britons, if not the Romans, converted them to their advantage. Under the Saxons they appear to have been neglected; but after the coming in of the Normans, they produced very considerable revenues to the earls of Cornwall, particularly to Richard, brother of king Henry III. Several regulations were afterwards made to encourage adventurers; a charter, and various immunities being granted by Edmund, earl Richard's brother, who also framed and ratified the *stannary laws,

* These laws are relating to the tin mines, which from stannum, (tin) are called stannaries. There are five stannary courts in Cornwall, which have their respective jurisdictions, and as many towns where the tin must be coined, or stamped with the seal of the duchy. When the legal duties are paid, the tinner may sell his tin where he thinks proper; but if the king, or the duke of Cornwall, wishes to purchase it, they may always claim pre-emption.

laying a certain duty upon the tin, payable to the earls of Cornwall. Edward III. confirmed the tinners in all their privileges, and erected Cornwall into a dukedom, with which he invested his son, Edward the Black Prince; and since that time, the heirs apparent to the crown of England, if eldest sons, have enjoyed it successively.

The working of the tin mines is extremely difficult, not only on account of the great depth to which the workmen are sometimes obliged to sink their shafts or pits, but also because the rocks through which a passage is to be cut, are so hard, that they can scarcely dig a foot in a week. The soft shaking earth found in these mines is also very troublesome, on account of the unwholesome vapours it exhales, and the currents of water that frequently issue from it. When the ore is dug and drawn out of the mine, it is broken to pieces with large hammers, and then carried to a stamping mill, where it is pounded still smaller, and the water passing through, washes away the earthy parts, leaving the metallic ones behind. It is then dried in a furnace on iron plates, and ground to powder in a crasing mill; after which it is again washed and dried, and in this state the metallic matter is called black tin. To convert it into white tin, or metal, they carry it to a furnace, where, by means of a charcoal fire, kept up by very large bellows, it is smelted; and when it is cold, they forge it, which is the last thing done to it in the works. Two pounds of black tin, when smelted, yield about one of white. It is remarkable, that the dross or scoria scummed off the tin fusion, and melted down with fresh ore, runs into metal; and even the matter washed and separated from the metal in the mill, being thrown up in heaps, after resting six or seven years, will, by fetching over again, as they term it, yield as good tin as that of Germany.—SMITH'S *Wonders*.

COPPER MINES.

No part of Europe affords richer copper than Cornwall, though the mines have not been worked with considerable advantage much more than a century. It is there discovered in a vast variety of ores, the most common of which is of a yellow brass colour; but there are also red, grey, black, blue, and green; the black, blue, and green, yield but little; the grey contains more metal than the yellow, and the red more than the grey. There are besides, in most of the mines, considerable quantities of malleable copper, which from its purity, the miners term virgin ore. This is combined and allayed with various substances; sometimes with base crystal, sometimes with a gravelly clay, and sometimes with the rust of iron: its figure is also very various, being sometimes in thin plates, shaped like leaves, sometimes in drops and lumps, sometimes branched, fringed, or twisted into wires; sometimes crossed at the top like a dagger, and sometimes resembling hollow filligree. It has also been found in powder, little inferior in lustre to that of gold, in solid masses of several pounds weight, maturated, unmixed, and highly polished, and in a congeries of combined granules. The water in which the copper ore is washed, has been discovered to make blue vitriol of the best kind; and that which comes from the bottom of the mines, is so strongly impregnated with copper, that were it detained in proper receptacles, it would produce great quantities of malleable copper, without any hazard or attendance, and with little more charge than the purchase of a much less quantity of the most useless old iron; which, being immersed in this water, will, in about fourteen days, produce more than its weight of what is called copper mud, whence may be obtained a great proportion of pure copper.—SMITH'S *Wonders.*

SALT MINES.

At Wielitska, a small town, about eight miles from Cracow, in Poland, is a remarkable salt mine, excavated in a ridge of hills at the northern extremity of the chain which joins to the Carpathian mountains, and has been wrought above 600 years; for they are mentioned in the Polish Annals, so early as 1237, under Boleslaus the Chaste, and not then as a new discovery; though how much earlier they were known cannot be ascertained. There are eight openings or descents into this mine, six in the field, and two in the town itself, which are chiefly used for letting down the workmen, and taking up the salt; the others being used for taking in wood and other necessaries. The openings are five feet square, and about four wide; they are lined throughout with timber, and at the top of each of them is a large wheel, with a rope as thick as a cable, by which things are let down and drawn up, and this is worked by a horse.

When a stranger wishes to gratify his curiosity by seeing the works, he must descend by one of these holes; he is first to put on a miner's coat over his clothes, and being led to the mouth of the hole, by a miner, who acts as a guide, the miner fastens a smaller rope to the larger one, and ties it about himself; he sits in this, and taking the stranger in his lap, gives the sign to be let down. When several persons go down together, the custom is, that when the first is let down about three yards, the wheel stops, and another miner takes another rope, ties himself, takes another in his lap, and descends about three yards further, the wheel there stops for another pair, and so on till the whole company are seated; then the wheel is again worked, and all the adventurers are lowered down together. It is no uncommon thing for forty people to go down in this manner. When the wheel is finally set agoing, it never

stops till they are all down; but the descent is very slow and gradual, and it is a very uncomfortable time, while they all recollect that their lives depend entirely upon the strength of the rope. They are carried down a narrow and dark well, to the depth of 600 feet perpendicular; this is in reality an immense depth, but the terror and tediousness of the descent, makes it appear to most people, vastly more than it is. As soon as the first miner touches the ground at the bottom, he slips out of the rope and sets his companion upon his legs, and the rope continues descending till all the rest do the same.

The place where they are set down is perfectly dark; but the miners strike fire, and light a small lamp, by means of which, (each taking the stranger he has care of, by the arm) they lead them through a number of passages and meanders, all descending lower and lower, till they come to certain ladders, by which they descend an immense depth, and this through passages perfectly dark. The damp, cold, and darkness of these places, and the horror of being so many yards under ground, generally make strangers repent before they get thus far; but when at the bottom, they are well rewarded for their pains, by a sight that could never have been expected after so much horror.

At the foot of the last ladder, the stranger is received in a small dark cavern, walled up perfectly close on all sides. To increase the terror of the scene, it is usual for the guide to pretend the utmost terror on the apprehension of his lamp going out, declaring that such an accident must be attended with the most fatal consequences. When arrived in this dreary chamber, he puts out his light, as if by accident; but, after some time, catches the stranger by the hand, and drags him through a narrow creek into the body of the mine, when there bursts at once upon his view a little world, the lustre of which is scarcely to be imagined. It is a spacious plain, con-

taining a whole people, a kind of subterranean republic, with houses, carriages, roads, &c. This is scooped out of one vast bed of salt; which is all a hard rock, as bright and glittering as crystal; and the whole space before him is formed of lofty arched vaults, supported by columns of salt, and roofed and floored with the same, so that the columns, and indeed the whole fabric, seem composed of the purest crystal. There are several lights in this place continually burning, for the general use; and the blaze of those reflected from every part of the mine, gives a more glittering prospect than any thing above ground can possibly exhibit.

Were this the whole beauty of the spot, it were sufficient to excite astonishment and admiration; but this is only a small part. The salt (though generally clear and bright as crystal,) is, in some places, tinged with all the colours of precious stones, as blue, yellow, purple, and green; there are numerous columns wholly composed of these kinds, and they look like masses of rubies, emeralds, amethysts, and sapphires, darting a radiance which the eye can hardly bear, and which has given many people occasion to compare it to the supposed magnificence of heaven. Besides the variety of forms in those vaults, tables, arches, and columns, which are framed as they dig out the salt, for the purpose of keeping up the roof, there is a vast variety of others, grotesque and finely figured, the work of nature; and these are generally of the purest and brightest salts. The roofs of the arches are, in many places, adorned with salt, hanging from the top in form of icicles, and having all the hues and colours of the rainbow. The walks are covered with various congelations of the same kind; and the very floors, when not too much trodden and battered, are covered with globules of the same sort of materials.

In various parts of this spacious plain stand the huts of the miners and families, some single, and

others in clusters like villages. They have very little communication with the world above ground; and many hundreds of people are born and live all their lives here. Through the midst of this plain lies a road, which is always filled with carriages, loaded with masses of salt out of the farther part of the mine, and carrying them to the place where the rope belonging to the wheel receives them; the drivers of these carriages are all merry and singing, and the salt looks like a load of gems. A great number of horses are kept here, and, when once let down, they never see day-light again; but some of the men take frequent occasions of going up, and breathing the fresh air.

The instruments principally used by the miners are pick-axes, hammers, and chisels, with which they dig out the salt in forms of huge cylinders, each of many hundred weight. This is found the most convenient method of getting them out of the mine; and, as soon as got above ground, they are broken into smaller pieces, and sent to the mills, where they are reduced to powder. The finest sort of salt is frequently cut into toys, and often passes for real crystal. This hard kind makes a great part of the floor of the mine; and what is the most surprising in the whole place is, that there runs constantly through a large part of the mine a spring of fresh water, sufficient to supply the inhabitants and their horses, so that they have no need of any from above ground. The horses usually grow blind after they have been some time in the mine; but they do as well for service afterwards as before.

The salt dug from this mine is called ziebna, or green salt, but for what reason it is difficult to determine, its colour being an iron grey; when pounded, it has a dirty ash colour, like what we call brown salt. The mine appears to be inexhaustible, as will easily be conceived from the following account of its dimensions, given by Mr. Coxe:—Its known breadth, says he, is 1,115 feet, its length 6,691 feet,

VICTORIA BRIDGE.

and its depth 743 feet. This, however, is to be understood only of the part which has been actually worked: as to the real depth or longitudinal extent of the mine it is not possible to conjecture.—SMITH'S *Wonders.*

VICTORIA BRIDGE.

THIS bridge may justly be placed as one of the Wonders of Art. It is built on the line of the Durham Junction Railway, over the valley of the river Wear, at a place called Pencher, near to which it branches off from the Stanhope and Tyne Railway, is distant about eight miles from Shields, a similar distance from the city of Durham, and, by the river line, nearly six miles from Sunderland. It is almost needless to say, that it received its name in honour of our gracious Queen. This bridge, erected at a cost of £35,000, has four main arches of the following dimensions:—Span of the river arch, 160 feet; of the north arch, 144 feet; of the two end arches, each 100 feet. Height, from the foundation of the main pier to the parapet, 156½ feet; height, from the line of low-water to the underside of the arch, 120 feet; clear width of road-way, 21 feet; total length of bridge, 820 feet. Of these arches three are aqueductal, being thrown over the valley, to obtain the requisite railway level. There are, besides, six smaller arches (three on each side) inserted in the approaches or wing walls, to lighten the masonry and add unity to the design. There is a double line of railway over the bridge, with an excellent flagged causeway on each side for foot passengers. If we deduct the solid masonry beneath the waves it leaves the solid walling of the bridge 130 feet, which is considerably higher than the celebrated Sunderland bridge, under which a ship in full sail can pass with-

out lowering her topsails.* Taking the height and span, it is the longest arch in Europe. True it is, that the arch of the bridge over the river Dee, near the city of Chester, is wider; and it is also on record, that the Spanish bridge at Alcantara, near Lisbon, is more lofty: but taking into consideration the united difficulties of extent of span, and height from the water level, which have been successfully encountered in the construction of the Victoria Bridge, it must stand unrivalled.

NEW LONDON BRIDGE.

THE first stone of this bridge was laid on the 15th of June, 1825, by the Lord Mayor, in the presence of the Duke of York, a great number of noblemen, gentlemen and ladies, and a large concourse of people.

The dimensions of the New Bridge are as follows:—Centre arch, span, 150 feet, rise, 32 feet, piers, 24 feet; arches next the centre, span, 140 feet, rise, 30 feet, piers, 22 feet; abutment arches, span, 130 feet, rise, 25 feet, abutment, 74 feet. The full width, from bank to bank, 690 feet; length of bridge, including abutments, 950 feet; ditto, without abutments, 782 feet; width of the bridge, from outside to outside of the parapets, 55 feet; carriage way, 33 feet 4 inches.

The arches are constructed solely of granite, of the finest description and workmanship, from the quarries of Devonshire, Aberdeen, and Cornwall. The piers and abutments are also constructed externally of the same material; but are filled inside with the hardest Yorkshire and Derbyshire stone. The cornices and parapets are wholly of granite.

* The first stone of this bridge was laid on the 24th of September, 1793, and completed in less than three years. It cost 26,000*l*. 260 tons of iron were used in it, of which 46 tons are of malleable iron, and 214 cast metal, formed into small segments, which are fitted to each other.

The stairs and the accompanying pedestals are also constructed of granite. We believe there are 77 steps, of which 30 are covered at high-water. There are two landings, to break the abruptness of the ascent. The width of the stairs is proportioned to the bridge; while the beautiful pedestals at the summit, composed of granite blocks weighing 25 tons, challenge the admiration of the spectators.

On the City side, the road-way, which extends to a fine open area, created by the demolition of the houses in front of the Monument, back to Crooked Lane and thence to East-cheap, is supported by 11 brick arches, with the exception of the elliptical arch over Thames Street. This latter arch is faced with granite, and the interior is constructed of Yorkshire stone. On each side of this arch are rustic gateways leading to a succession of steps, which enable the passengers from Thames Street to reach the bridge without taking a circuitous route. At the Southwark side of the bridge, the roadways are supported by 22 brick arches, of a similar character to the City side, with the exception of a beautiful arch communicating with Tooley Street. This is faced with granite, but the interior is of brick, completed in the most masterly style of workmanship. The line of road on this side, for the present, terminates at the entrance to St. Thomas's Street; but it is intended ultimately that it should be carried forward to the wide opening in front of the Town Hall—a most desirable improvement. The side communicating with Tooley Street will, in like manner, open itself at the wide part near the entrance to Bridge Yard.

The bridge is lighted with gas. There are double lamps over each arch, and treble lamps over the centre arch. The pillars are cast from the cannon taken in our continental wars, which had long been lying useless in Woolwich Dock-yard. They were cast by Mr. Parker, of Argyle Street, from an elegant classical design, and have a very chaste appearance.

At present, we believe the gross expenses of the erection of the bridge exceed £650,000. The purchase of property to open the approaches are not included in this calculation.

This bridge was opened with great splendour and magnificence on the 1st of August, 1831, by his late Majesty, William IV. and his consort Queen Adelaide, in the presence of an immense concourse of people.

WESTMINSTER BRIDGE.

WESTMINSTER BRIDGE is universally allowed to be one of the finest in the world. The first stone of this noble structure was laid on the 29th of January, 1738, by the Earl of Pembroke, and was finished and opened on the 17th of November, 1750. It is adorned and secured on each side by a very lofty and noble balustrade. Over every pier is a recess on each side, forming a semioctagon, and twelve of these are covered with half domes, four at each end, and four in the middle. Between those in the middle are pedestals, which were intended to support a group of figures, and the whole is lighted in the night by a great number of lamps beautifully disposed.

This magnificent structure is 1,223 feet in length, and 44 in breadth. The space allowed for passengers consists of a commodious foot-way, 7 feet broad on each side, paved with broad moor-stone; and the intermediate road is sufficient to admit the passage of three carriages and two horses a-breast. The bridge consists of thirteen large and two small arches, with fourteen intermediate piers. The arches are all semicircluar, and spring from about 2 feet above low-water mark; the centre arch is 76 feet wide, and the rest decrease in width equally on each side by four feet; and the free course for the water under the arches is 870 feet, so that there is no sensible fall of water. The foundation is laid on a firm and solid mass of gravel, which lies at the bottom of the bed

of the river; but at a much greater depth on the Surrey than on the Westminster side; and this inequality of the ground required the length of the several piers to be very different, as some have their foundations laid at 5, and others at 14 feet under the bed of the river. The piers are all 4 feet wider at their foundations than at their tops, and are founded on the bottoms of the wooden cases on which they were built. All the piers consist of solid blocks of Portland stone, many of which are four or five tons weight, and none less than a ton, except the closers, or smaller stones, intended for fastening the rest, one of which is placed between every four of the larger blocks.—SMITH'S *Wonders.*

BLACKFRIARS BRIDGE.

THIS bridge consists of nine arches, which being elliptical, the apertures for navigation are large, while the bridge itself is low. When a person is under one of these arches, the extent of the vaults overhead cannot be viewed without awe!

The upper surface of this bridge is a portion of a very large circle; so that the whole forms one arch, and appears a gentle swelling ground under foot all the way. Over each pier is a recess, or balcony, containing a bench, and supported below by two ionic pillars and two pilasters, which stand on a semicircular projection of the pier, above high-water mark. These pillars give an agreeable lightness to the appearance of the bridge on either side. At each extremity of the bridge spreads open the foot-ways, rounding off to the right and left a quadrant of a circle, by which an open access is formed, no less agreeable than useful on the approach.—NORTHOUKE'S *History of London.*

The centre arch of this fine bridge is exceeded by very few in the world, and is considerably larger than that of the Rialto at Venice. The expense of the

erection of this bridge, is said to have amounted to £152,840.

WATERLOO BRIDGE.

THIS bridge is universally considered one of the finest structures of the kind in the world. Mr. G. Dodd first projected it, and attained the requisite act of Parliament; but some subsequent disagreements led to the appointment of Mr. Rennie as the architect. The bridge was begun in 1811, and opened with great splendour by the Prince Regent, June 18th, 1817, the anniversary of the battle of Waterloo. The arches are all of one size, in consequence of which the road over them is level, differing in this respect from every other bridge, except those constructed with suspension chains. The dimensions of this structure are as follows:—Length of the stone-work between the abutments, 1242 feet; length of the road on the Surrey side, which is supported by forty brick arches (under one of which the street is continued from Narrow-wall,) 1250 feet; length of road supported on brick arches, on the Strand side, 400 feet; width of carriage road twenty-eight feet, and of each foot pavement seven feet; span of each arch 120 feet; extent of water-way in the clear, 1080 feet. The iron turnstiles, which admit of only one person passing at a time, touch some machinery communicating with a clock locked up in each toll-house, the index of which is thereby moved, so that, on looking at it, the number of those who have passed is directly seen. The bridge is exactly on a level with the Strand, and fifty feet above the surface of the Thames.

SOUTHWARK BRIDGE.

THE first stone of this bridge was laid by Lord Keith, in the centre of the river, on Tuesday, May 23rd, 1815; and on the 7th of June, 1817, being the

fifty-seventh year of the reign of his Majesty George III., and in the regency of H. R. H. George, Prince of Wales, the Right Hon. Matthew Wood, Lord Mayor of London, attended by several of the aldermen and the sheriffs of the city, accompanied by the committee of management, of which Sir John Jackson, Bart., M. P., was chairman, laid the first stone of the north, or London abutment of this bridge, which connects the City of London with the Borough of Southwark.

	FEET.
Length of iron bridge within abutments	700
Width within the balustrade	42
Ditto of paved foot-way on each side	7
Ditto of carriage-way	28
Thickness of each pier	24
Span of centre arch	240
Ditto of outside arches	210
Clear water-way under the three arches	652
Span of the first brick arch on the London side from the river, for the carriage-road leading to the wharfs	24
Span of each of the nine brick arches on the London side	15
Span of the first brick arch on the Surrey side from the river, for carriage-road leading to Blackfriars bridge	25
Span of the seventeenth arch, over Maid-lane, on the Surrey side, for carriage-road	24
Span of each of the twenty brick arches on the Surrey side	15
Total number of brick arches, 32.	
Length of the road supported on brick arches on the London side	250
Length of the road supported on brick arches on the Surrey side	528
Total length, including the bridge	1478

Weight of iron in the middle arch, 1,665 tons; in the two side arches 2,920 tons—total 4,585 tons. Messrs. Walker and Co., Rotherham, Yorkshire, were the founders of the iron-work; Mr. John Rennie, F.R.S., architect and engineer; and Messrs.

Jolliff and Banks, contractors. The success which has attended the building of this bridge settles the question as to the practicability of erecting bridges of such extraordinary span. The centre arch of this bridge is the largest that exists in the world; its span is four feet more than that of the famous bridge at Sunderland; and it is 38 feet more in span than the Monument is in altitude. The whole expense of this truly national work, and of forming the avenues leading to it, is estimated at about £650,000

THE MENAI BRIDGE.

As a triumph of art, the suspension bridge across the Menai Straits, uniting the Island of Anglesey with the main land, is considered the finest object in the British dominions. A few years ago, the idea of connecting these rocky mountains, by a strong, safe, and elegant roadway, at an altitude to admit of the passing of the largest ships underneath, would have been looked upon as chimerical. But the beautiful modern invention of the suspension chains has accomplished that which set at defiance the utmost science of the bridge-builder.

At the edge of the water are erected two towers, 160 feet high, one on each side: they are about 40 feet wide, at the height of 100 feet from the surface of the water. At this point two archways are left in them, through which the passengers and carriages pass to the roadway. The distance between these two towers or piers, or that space which, in ordinary bridges, would be called the span of the bridge, is 550 feet, or nearly *four times as wide as the largest stone arch ever yet built.*

The roadway that unites the suspended platform to the main land is supported by stone arches of great size and beauty, in a similar manner to the arches of an ordinary bridge.

There are four different main suspension chains,* the one in the middle is a narrow path, four feet wide, for foot passengers, and the two others on the outside are each twelve feet wide, for carriages and cattle: and of these two roads, one is appropriated for carriages, &c., going in one direction, and the other for those going the opposite way.

RICHMOND BRIDGE.

THIS bridge, which connects Richmond with Twickenham, consists of five semi-circular stone arches, and is an elegant structure, constituting, with the neighbouring scenery and villas, one of the most picturesque views about the metropolis. It was built from a design by Paine, was finished in 1777, and cost £26,000. The river is about 300 feet wide at the part which the bridges crosses, and 9 miles distant from London.

FINE STONE BRIDGE AT BERN.

AT Bex, in the canton of Bern, is a stone bridge over the Rhone, which is nearly 500 feet long, and consists only of one arch, of a considerable height, with a handsome tower on the top. And in the canton of Uri is a stone bridge over the Russ, of a surprising height, consisting solely of one arch, resting upon two high rocks. The neighbouring peasants have given it the name of "the Devil's Bridge," from a simple opinion that such a stupendous work must have been erected by the devil.—SMITH'S *Wonders.*

* The suspension chains are not made in the ordinary way, with round or oblong links, but each link is formed of five solid bars of iron, each bar being nine feet nine inches long, three inches wide, and one inch thick, and they are fastened to each other like the links in the main chain of a watch.

THE RIALTO AT VENICE.

THE famous Bridge at Venice, called the Rialto, is universally allowed to be one of the finest in Europe. It was built in the year 1591, from a design of the celebrated Michael Angelo, and is said to have cost 250,000 ducats. It consists of a single arch all of marble; has rails on each side, and two rows of shops in the middle. The dimensions of this bridge are as follow:—the compass of the arch is exactly one-third part of a circle; its width on the level of the water, from one extremity to the other, is 95 feet, and its height 24.

FINE BRIDGE OVER THE RHONE.

THE famous Bridge over the Rhone, at St. Esprit, in Languedoc, is reckoned one of the finest in Europe. This bridge is of stone, and of a great length, consisting of twenty-six arches, whose piers are secured by two pedestals that surround them, which have their projectures like rows of steps or stairs, the lowermost projecting most, the others less by degrees. Above these are several small arches, which divide the feet of the great ones, and reach as low as the plane to the uppermost pedestal. As the Rhone is a very rapid river, this bridge is admirably contrived to withstand its violence; for the unequal juttings of the pedestals serve gradually to break the force of the stream, and when the flood swells so high as to cover them, (which it frequently does,) the small arches, or openings, in the piers give a free passage to the water, which might otherwise endanger the fabric. Besides the bridge is not straight, but bent in several places, forming unequal angles, which are greatest where the current is strongest, and thereby its fury is opposed and broken. Dr. Smollett, mentioning this bridge, observes, that it is

a great curiosity from its length, and the number of its arches; but that the arches are too small, the passage above is too narrow, and the whole appears too slight to resist the impetuous force of the river.

FLYING BRIDGES AT CHINA.

BEFORE we dismiss the subject of foreign bridges, we ought to mention some of the Chinese bridges, which may be looked upon as wonderful pieces of art, scarcely to be paralleled by any thing of the kind in Europe. The most surprising of these structures is that which has obtained the name of the flying bridge, from its being built over a river from one mountain to another, and consisting only of one single arch, 500 cubits high, and 400 long.

There is another remarkable bridge in the province of Shansi, at the conflux of two large rivers, which is built upon 130 barges chained together, but so contrived as to open and admit vessels to pass through, after paying the usual toll. This sort of bridge is common in China; but they have another sort built upon pillars without any arches, and some of these of a great length and breadth; particularly one in the province of Fo-kien, which is 360 perches long, and 1½ broad. It is all of white stone, supported by 300 pillars; has a parapet on each side, and is adorned with the figures of lions at certain distances, and a variety of other sculptures.

Some of their arched bridges are likewise of considerable length, breadth, and beauty; especially that of Fuchew, the capital of Fo-kien, which is above 150 perches long, and consists of 100 lofty arches. The parapets of this bridge are also adorned with figures of lions and other animals.—SMITH'S *Wonders*.

BRIDGES OVER THE SEA.

XERXES caused a bridge to be built across the Hellespont, a strait which joins the Archipelago and the Sea of Marmora, and is at the narrowest part about a mile and a half broad; the exact place where the bridge was built is not certainly known. Xerxes' fleet consisting of 3000 sail, conveyed the greatest army on record, which, according to Herodotus, amounted to 1,700,000 foot, besides cavalry, mariners, and attendants of the camp.

According to Polymnia, as recorded in Major Rennell's Ancient Geography, the bridge was built thus: "They connected together ships of different kinds, some long vessels of fifty oars, others three-banked galleys, to the number of 360 on the side towards the sea of Marmora, and 313 on that of the Archipelago. The former of these were placed transversely, but the latter, to diminish the strain on their cables, in the direction of the current. When these vessels were firmly connected to each other, they were secured on each side by anchors of great length on the upper side, because of the winds, which set in from the Euxine and the S. and S. E. They left, however, openings in three places, sufficient to afford a passage for light vessels which might have occasion to pass to or from the Euxine. Having performed this, they extended cables from the shore stretching them on large capstans: for this purpose they did not employ a number of separate cables, but united two of white flax with four of biblos. When the pass was thus secured, they sawed rafters of wood, making their length equal to the space required for the bridge; these they laid across the extended cables, binding them fast together. They next brought unworked wood, which they placed on the rafters; over all they threw earth, and finished by a fence on each side, to prevent the horses and beasts of burthen from being terrified by the sea.

This bridge is said to have been completed in the space of a week.

Xerxes was son of Darius Emperor of Persia, who invaded Greece 481 years before Christ; he was defeated at Salamis by sea, and at Platæa by land, and driven out of Greece in two years. Darius, father of Xerxes, made an attempt on Greece, according to Justin, with 700,000 men and 600 ships, about ten years before that of his son; he likewise built a bridge of boats over the Bosphorus, a strait that joins the Euxine to the sea of Marmora; this strait at the narrowest is about a quarter of a mile over. In calm weather, those on its banks can converse together across it.

STONE BRIDGE OVER THE SEA.

The bridge of Suen-tcheou, in the province of To-Kien, is built over an arm of the sea, and supported by above 300 pillars. Its length is about 2500 feet, its breadth twenty, and the stone-work, from pier to pier, at the top, consists of large single massy stones.

At Schaffhausen there was a very extraordinary bridge over the Rhine, built by Ulric Grubennoan; it was destroyed by the French in 1799.

PRECIOUS STONES.

THE following may be considered as the most valuable of the precious stones: the diamond, ruby, emerald, topaz, jasper, garnet, and opal,

THE DIAMOND.

This is a crystallized stone in the form of an octahedron, more or less well shaped: it is generally white, but is found of various colours, as red, like the ruby, orange, like the hyacinth, blue, like the sapphire, and green, like the emerald; the last of which is most rare and of the greatest value when it

is of a beautiful tint; the rose, blue, and yellow diamonds are the next in value. Transparency and brilliancy are the natural and essential qualities of the diamond, which exhibits but a single refraction of the rays of light. Diamonds are divided into oriental and occidental, or Brazilian, the former being the most valuable. Bœtius de Boot, in his "History of Gems," conjectured, in 1609, that the diamond was inflammable. Mr. Boyle discovered, in 1673, that when exposed to a high temperature, it gave out acrid vapours, in which a part of it was dissipated. Sir Isaac Newton, who composed his "Optics" in 1675, concluded, from its great refracting power, that it must be combustible, and that it might be an unctuous substance coagulated. But the celebrated Averàni, in 1695, in presence of the Grand Duke of Tuscany and several philosophers, shewed, by concentrating the rays of the sun upon it, that the diamond was exhaled in vapour and disappeared entirely; while other precious stones only grew softer. Since that period, however, various chemists have burned diamonds with as much facility as a piece of iron wire or wood, by exposing them on a piece of charcoal placed in the flame of a common lamp, or even a candle, and blown with a current of oxygen gas. It has also been ascertained by Guyton, Davy and others, that although diamonds, whether oriental or occidental, are the hardest of all known bodies, they yet contain nothing more than pure charcoal, or carbon. The extreme hardness and transparency of this carbon furnish a problem which has hitherto baffled the efforts of philosophers to solve satisfactorily. Nevertheless, the knowledge of the inflammability of diamonds has very considerably reduced their mercantile value, and will probably bring it like that of all other articles, to the common standard of comparative use.

Diamonds were first brought to Europe from the East Indies, where they are found in various parts: the first mine known there is that of Sumbulpour, on

the river Goual, which falls into the Ganges. A chain of mountains extending from Cape Cormorin to Bengal, chiefly those in the kingdom of Golconda, produces the greatest quantity of diamonds, which are sent to Calcutta, where they are sorted, sealed up in bags, and conveyed to London. The total annual value of the diamonds so collected, is said to amount to £142,500, exclusive of those smuggled. Among these diamonds, one of the weight of 193 carats,* equal to about 1oz. 12dwt. Troy, and the largest hitherto discovered, was found, for which the Empress of Russia (Catharine II.) offered £104,166. 13s. 4d. besides an annuity for life of £1041. 13s. 6d. which was refused; but was afterwards sold to Catherine's favourite, Count Orloff, for the above sum without the annuity, who presented it to the Empress on her birth-day, in 1772. The Queen of Portugal possesses the next largest diamond in Europe.

BRAZIL DIAMONDS.

In 1728, it was discovered that diamonds were found in some branches of the river das Caravilas, and at Serro de Trio, in the province of Mino Geraes, in the Brazils belonging to Portugal. The Rio Janeiro fleet brought home at once 1146 ounces of them. Such a considerable supply would have reduced the value of diamonds, had not the Government of Portugal laid restrictions on the persons who searched for them. The diamonds are found in the rivers, the course of which has been more or less altered; and it seems probable that they are washed down by the torrents from the mountains, as they are found in the greatest plenty after violent storms of rain.

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* A carat with jewellers is four grains. This diamond exceeds the famous Pitt diamond in size, and is reckoned equal in water. It is now in the sceptre of Russia, and is considered as the finest of the sort in Europe.

The crust which envelopes the rough diamond is found thicker on those from Brazil, than those from the East Indies, and hence they are easily distinguished in their natural state; but as the most skilful lapidaries may be deceived in them after they are cut, they are accordingly of equal value in trade. This equality, however, is only to be understood of the small ones, as most of the occidental diamonds beyond four or five carats have blemishes, which are seldom found in the oriental, and in that case the difference is great. Some artists are of opinion that the latter are harder and more brilliant than the former; but this opinion is not sanctioned by experiment.

Diamonds are generally found near the line, and none beyond the tropics.

The usual method of seeking diamonds, is by throwing the stones and rubbish with which they are supposed to be mixed, into a cistern full of water, having a cock and plug at the bottom. The lumps are then broken, and the muddy water drawn off till the stones are washed clean. When the sun shines bright, the sand and stones which remain in the cistern are carefully examined; in this business the workmen are so expert, that the smallest stone cannot escape them, and the brightness of the sun being reflected by the diamonds, assists them in the search.

The cutting and polishing of diamonds are performed by rubbing them against each other, and the powder or dust thus disengaged, serves to grind and polish them: these latter operations are done by means of a mill, which turns a wheel of soft iron, sprinkled over with diamond-dust mixed with olive oil. The same dust well ground and diluted with water and vinegar, is used for sawing diamonds, which is performed with an iron or brass wire as fine as a hair.

THE RUBY.

This is a gem of a sparkling red, and of the first rank among precious stones. The oriental ruby, which is the finest, is chiefly found in the kingdom of Pegu, in the farther peninsula of the East Indies, and in the island of Ceylon at the entrance into the gulf of Bengal. There are likewise rubies found in the Brazils, in Bohemia, and Hungary; particularly in the latter, there is a mine of flints, which on being broken, rubies are found of equal quality with the oriental ones.

Of rubies there are four species: the oriental ruby is of a purplish red, verging sometimes to violet, and is next to the diamond in hardness, except the oriental sapphire. The spinal ruby is not so hard, and is of a red colour, with a slight tinge of orange. The balass ruby is of a pale red, and appears only a variety of the spinal. The Brazilian ruby is red inclining to yellow, which makes it confounded sometimes with the topaz.

THE EMERALD.

This is a precious stone of a green colour, and transparent; in hardness it is a little inferior to the garnet and beryl. Emeralds are found in the East Indies and in Peru, South America: that of the East is harder, more brilliant and transparent than the Peruvian, which is generally clouded and less sparkling. Inferior ones are found in various parts, and some in Britain. It has been alleged that there were no true emeralds before the conquest of Peru; but there is a genuine emerald in the Paris Museum taken from the mitre of Pope Julius II. who died in 1513, and Peru was not conquered till 1545, hence it is inferred that this emerald was brought from Africa or the East.

Theophratus mentions having seen an emerald in a temple in Egypt four cubits long and three broad;

and of an obelisk of emeralds forty feet high. But many of the stones called emeralds by the ancients, and even by the moderns, as the emerald table in the abbey of Reichenau, near Constance, Switzerland, and the famous *sacro catino* (sacred bason) of Genoa, are only fine green-coloured fluor spar, of which some fine specimens are found in Derbyshire.

THE TOPAZ.

The topaz (derived from Topazos, a small island in the Red Sea, where it is said the Romans collected it) is transparent and of a beautiful yellow or gold colour; it is very hard and takes a beautiful polish. It is found in the East Indies, Ethiopia, Arabia, Pegu, Brazil, Bohemia, Saxony, and Britain; but those of the east are most valuable. The topazes of Madagascar formerly were much esteemed, but are not now considered of any value.

There are four distinct varieties of topaz; the oriental topaz, which is a bright golden yellow; of this there is a variety called pistachio topaz, a yellow inclining to green. The Brazilian topaz is deeper coloured than the oriental, and when exposed to a strong heat becomes of a rosy red, and is then sold for Brazilian ruby. The Saxon topaz is of a pale yellow, and in a gentle heat turns white, in which state it is often sold for diamond.

The topaz of the ancients is considered to be the same as the chrysolite of modern mineralogists.

JASPER.

Jasper is a precious stone, not much different from the agate, except that it is more opaque, softer, and does not take so good a polish. The florid jasper, found in the Pyrenees, is usually stained with various colours, though some have only one colour, as red or green; but these are least valued. The green, spotted with red, that which borders on a purple colour, or that of a carnation, is held in the highest estimation.

GARNET.

The granate, or garnet, as it is commonly called, is a gem of a red colour, resembling that of the kernel of a pomegranate, from whence it derives its name. Granates are distinguished into oriental and occidental; the former are brought from several parts of the East Indies—the latter are found in Spain, Bohemia, and Silesia; of which last sort those of Bohemia are most valued, and sometimes preferred to the oriental kind.

THE OPAL.

The opal, a gem of a very peculiar kind, and much valued in all ages, is likewise found in Arabia, and that in greater perfection than in Europe. It is softer than any other of the fine gems, and not easily polished; but, being naturally of a smooth surface and tolerable gloss, some of the best of them are worn with their native polish only. It is found of various sizes, but most frequently between that of a pea and a horse-bean; though sometimes it is met with as small as the head of a pin, and sometimes as large as a walnut. Its shape is likewise uncertain, some being irregularly oblong, others perfectly round, and others in the form of a kidney. Its colour is of so mixed a nature, that it is not easy to be described, being something like the finest sort of mother-of-pearl, but far exceeding it in lustre and transparency.

As it is variously turned about, it shows the colours of almost all the other gems, having the yellow of the topaz, the blue of the sapphire, the green of the emerald, the red of the ruby, and the fire-colour of the carbuncle, when held against the sun. All these colours, besides a white milky cast, are of a fine brightness and lustre, but are only the effect of different reflections of light falling on it in different angles, and not permanent and unalterable in the stone, like the single colours of other gems; for the

small fragments of opal do not show them, but are of a pale bluish or pearly grey, which is properly its genuine colour. Some opals want one or more of the above-mentioned colours, and are liable to be tinged with a deep bluish black; in which last case the gem shows no colour but its red in any light or position; but then the red appears remarkably glowing and fiery, and seems lodged very deep in the stone; so that in this state, which is but an imperfect one, it has an excellency beyond even its finest specimens.—SMITH'S *Wonders*.

POMPEY'S PILLAR.

THE pillar of Pompey, as it is generally called, is situated about a quarter of a league from the southern gate at Alexandria in Egypt. It is composed of red granite. The capital is Corinthian, ornamented with palm-leaves, and not indented. The shaft and the upper member of the base are of one piece, 90 feet long, and 9 in diameter. The base, which is a square block of marble, 60 feet in circumference, rests on two layers of stone, bound together with lead. The whole column is 114 feet high, perfectly well polished, and only a little shivered on the eastern side.

Nothing can equal the majesty of this monument; seen from a distance, it overtops the town, and serves as a signal for vessels; and on a nearer approach, it produces an astonishment mingled with awe. One can never be tired with admiring the beauty of the capital, the length of the shaft, and the extraordinary simplicity of the pedestal; although the latter has been rather damaged by the instruments of travellers, who were anxious to possess a relic of this antiquity: and one of the volutes of the column was immaturely brought down, in the year 1781, by a prank of some English captains, which is thus related by Mr. Irwin:

These jolly tars of Neptune had been pushing about

the can on board one of the ships in the harbour, until a strange freak entered into one of their brains. The eccentricity of the thought occasioned it immediately to be adopted, and its apparent impossibility was but a spur for the putting it into execution. The boat was ordered, and with proper implements for the attempt these enterprising heroes pushed ashore, to drink a bowl of punch on the top of Pompey's pillar! At the spot they arrived, and many contrivances were proposed to accomplish the desired point. But their labour was vain, and they began to despair of success, when the genius who struck out the frolic happily suggested the means of performing it. A man was despatched to the city for a paper kite. The inhabitants were by this time apprized of what was going forward, and flocked in crowds to be witnesses of the address and boldness of the English. The governor of Alexandria was told that these seamen were about to pull down Pompey's pillar. But whether he gave them credit for their respect to the Roman warrior, or to the Turkish government, he left them to themselves, and politely answered—That the English were too great patriots to injure the remains of Pompey. He knew little, however, of the disposition of the people who were engaged in this undertaking; for had the Turkish empire rose in opposition, it would not perhaps at that moment have deterred them. The kite was brought, and flown so directly over the pillar, that, when it fell on the other side, the string lodged upon the capital. The chief obstacle was now overcome. A two-inch rope was tied to one end of the string, and drawn over the pillar by the end to which the kite was affixed. By this rope one of the seamen ascended to the top; and, in less than an hour, a kind of shroud was constructed, by which the whole company went up and drank their punch, amid the shouts of the astonished multitude. To the eye below, the capital of the pillar does not appear capable of holding more than one man upon it; but our seamen found

it could contain no less than eight persons very conveniently. It is astonishing that no accident befel these madcaps, in a situation so elevated that would have turned a landman giddy in his sober senses. The only detriment which the pillar received was the loss of the volute before mentioned, which came down with a thundering sound, and was carried to England by one of the captains, as a present to a lady who commissioned him for a piece of the pillar. The discovery which they made amply compensated for this mischief, as, without their evidence, the world would not have known at this hour, that there was originally a statue on this pillar, one foot and an ankle of which are still remaining. The statue must have been of a gigantic size, to have appeared of a man's proportion at so great a height.

There are circumstances in this story which might give it an air of fiction, were it not demonstrated beyond all doubt. Besides the testimonies of many eye-witnesses, the adventurers themselves have left a token of the fact by the initials of their names, which are very legible in black paint just beneath the capital.

Learned men and travellers have made many fruitless attempts to discover in honour of what prince this stately pillar was erected: for, notwithstanding its common appellation, it could not have been raised to the memory of Pompey, as neither Strabo nor Diodorus Siculus have spoken of it. Abulfeda, in his *Description of Egypt*, calls it the pillar of Severus; and history informs us, that this emperor visited the city of Alexandria; that he granted a senate to its inhabitants, who, until that time, under the subjection of a single Roman magistrate, had lived without any national council; and that he changed several laws in their favour. This column, therefore, M. Savary concludes to have been erected by the inhabitants as a mark of their gratitude to Severus. And in a Greek inscription, now half effaced, but visible on the west

side when the sun shines upon it, he supposes the name of Severus to have been preserved. He further observes, that this was not the only monument erected to that emperor by the gratitude of the Alexandrians; for there is still in the midst of the ruins of Antinoe a magnificent pillar, the inscription on which is still remaining, and proves that it was dedicated to Alexander Severus. It has, however, been lately asserted that the above-mentioned inscription on what is vulgarly called Pompey's pillar has been deciphered, and proves that the column was erected in honour of Diocletian by the then prefect of Egypt.

ORGANIC AND ANIMAL LIFE COMPARED.

THE functions of the organic life are performed with uninterrupted continuity; to those of the animal life, rest is indispensable. The action of the heart is increasing: it takes not, and needs not rest. On it goes for the space of eighty or ninety years, at the rate of one hundred thousand strokes every twenty-four hours, having at every stroke a great resistance to overcome, yet continues this action for this length of time without intermission. Alike incessant is the action of the lungs, which is always receiving, and always emitting air; and the action of the skin, which is always transpiring and always absorbing; and the action of the alimentary canal, which is always compensating the loss which the system is always sustaining. But of this continuity of action, the organs and functions of the animal life are incapable. No voluntary muscle can maintain its action beyond a given time; no effort of the will can keep it in a state of uninterrupted contraction; relaxation must alternate with contraction; and even this alternate action cannot go on long without rest. No organ of sense can continue to receive impression after

impression without fatigue. By protracted exertion the ear loses its sensibility to sound, the eye to light, the tongue to savour, and the touch to the qualities of bodies about which it is conversant. The brain cannot carry on its intellectual operations with vigour beyond a certain period; the trains of ideas with which it works become, after a time, indistinct and confused; nor is it capable of re-action with energy until it has remained in a state of rest proportioned to the duration of its preceding activity. And this rest is sleep. Sleep is the repose of the senses, the rest of the muscles, their support and sustenance. What food is to the organic, sleep is to the animal life. Nutrition can no more go on without aliment than sensation, thought, and motion without sleep.

IRON IN OAK.

THE frequent effects of lightning upon this monarch of the forest, has excited the attention of the philosophic mind. After citing several examples of the manner in which the oak has been singled out from other trees immediately adjoining, and of equal height, a writer upon the subject says;—It is well known by chemists that oak contains a considerable portion of iron in its composition. This metal, it may be presumed, is held in solution by the sap, and equally distributed throughout the whole tree; may it not be owing to this circumstance that the oak is so frequently a victim to that power, which in fact it solicits with extended arms, to its own destruction? This is a fact worthy of notice, and ought to be generally known, in order to prevent persons taking shelter in situations attended with such imminent danger.

estimated weight of engines, boilers, and water, 500 tons; ditto of coals for 20 days' consumption, 600 tons; ditto of cargo, 500 tons; draught of water with the above weight and stores, 16 feet.

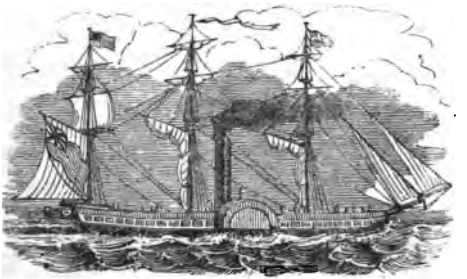
The British Queen is said to be the longest ship in the world, the length exceeding, by about thirty-five feet, that of any ship in the British navy. Her beauty is equal to the Great Western, some say she is far superior; and has occupied two years in building. The Great Western has four, instead of three masts, and she also possesses the advantage, if such it be, of a poop-deck. The internal arrangements of the British Queen, as to berths and saloon, are of the most costly and chaste description: while her mechanical powers, as to engine and other apparatus, are of the most substantial and perfect workmanship. Messrs. Napier and Co., of Glasgow, are the engineers. All her decorations are of English manufacture.

THE GREAT WESTERN STEAM SHIP.

This splendid vessel was built at Bristol, without any consideration as to cost and labour. As soon as her hull and rigging were completed, she proceeded to London to receive her engines and other steam apparatus. She sails between Bristol and New York; and has four instead of three masts. The tonnage of this vessel is 1340, of which it is computed the gross weight of the apparatus is 490; that of the boilers alone, with the water they contain, being 180, and the piston cranks 17 tons each. In the space surrounding the engines is stowage room, in iron boxes of very convenient construction, for 800 tons of coal, while the diameter of her paddle wheels are not less than 38 feet, and are moved by a 450 horse power. This statement will convey some idea of the force and rapidity with which she can be propelled through the water; and she has justified the confident expectations of her owners, and of the scientific persons who visited and examined her apparatus, that with

fair average weather, she would perform the voyage to New York in about twelve or fourteen days.* The dimensions of this spacious vessel are such as to afford a state cabin or saloon of 82 feet in length, with an extreme breadth of 34 feet, but of this a certain portion is taken up on each side for convenient and separate sleeping berths, except in the centre, when the entire space being left open, forms, instead, two commodious recesses, elegantly fitted up with sofas and looking-glasses. This saloon is decorated in the style of the age of Louis Quatorze. The sides, which separate it from the sleeping berths, consist of panels, divided by upright pilasters, surmounted by capitals of that character. These panels contain allegorical and emblematical paintings in the style of Parris and Wattieau. The prevailing colour throughout is a light salmon or flesh colour, with rich gold ornaments and decorations; but the frames of the looking-glasses are in imitation of Dresden china, and those of the settees are carved in oak. The cushions of the latter are covered with a new article composed of horse hair and American grass, said to be of greater durability than silk, of which it has much the appearance. This apartment is said to be of the most elegant and costly kind, and executed with the most profound judgment and skill. At the lower end of this saloon, on the right, is a small apartment elegantly fitted up with sofas and draperies, as a withdrawing room exclusively for the use of lady passengers. At the corresponding corner, on the left, is the steward's room, and a staircase leading to a cabin under the saloon entirely fitted up with sleeping berths of the first class, for gentlemen. The forecabin, which is divided from the principal one by the

* We believe the voyage from Bristol to New York is performed by this vessel in about fifteen or sixteen days; and that she makes the passage back from New York to Bristol in about twelve days and a half.



BRITISH QUEEN.

STEAM NAVIGATION.

THE first idea of Steam Navigation was set forth in a patent, obtained in 1736, by Jonathan Hulls, for a machine for carrying vessels against wind and tide, or in a calm. In 1778, Thomas Paine proposed, in America, this application of steam. In 1781, the Marquis de Jouffroy constructed one on the Soane; and in 1785, two Americans wrote and published a book upon it. In 1789, Symington made a voyage in one on the Forth of Clyde canal; and, in 1802, the experiment was repeated with success. Soon after, Mr. Fulton went to America; and, in 1807, started a steam boat on the Hudson's River, which succeeding, was imitated by hundreds. In June, 1819, the *Savannah*, of 350 tons, came from New York to Liverpool by steam. Our own rivers at the present day give sufficient proofs of the rapidity with which we have multiplied this advantageous method of increasing commerce and profits.

THE BRITISH QUEEN STEAMER.

The contemporary, if we may be allowed thus to express it, with the Great Western, is this equally splendid vessel. She was built by Messrs. Curling and Young, of Limehouse, for the British and American Steam Navigation Company, and was launched on the birth-day of the Queen, viz. 24th of May, 1838, hence her name. This vessel runs between London and New York, and the following is an accurate description of her dimensions, capacity, and power:—Extreme length from figure head to taffrail, 275 feet; length of upper deck, 245 feet; length of keel, 223 feet; breadth within paddle boxes, 40 feet 6 inches; breadth, including paddle boxes, 64 feet; depth, 27 feet; tonnage, 1862 tons; power of engines, 500 horses; diameter of cylinders, 71½ inches; length of stroke, 7 feet; diameter of paddle wheels, 30 feet;

have thick jaws and clumsy joints; they are easily tamed; for the horse, by nature, is a gentle, complying creature, and resists rather from fear than obstinacy. They are caught by a kind of noose, and then held fast by the legs, and tied to a tree, where they are left for two days without food or drink. By that time they begin to grow manageable; and in some weeks they become as tame as if they had never been in a state of wildness. If, by any accident, they are once more set at liberty, they never become wild again, but know their masters, and come to their call. Some of the buccaneers have often been agreeably surprised, after a long absence, to see their faithful horses once more present themselves with their usual assiduity; and come up, with a fond submission, to receive the rein.

At the Cape of Good Hope there are numbers of horses in a state of nature, but small, vicious, and untameable. They are also found in various parts of Africa; but the wretched inhabitants of that country either want the art to tame them, or seem ignorant of their uses. It is common with the Negroes, who are carried over from thence to America, when they first see a horse, to testify both terror and surprise. These poor men seem not to have any knowledge of such a creature; and, though the horse is probably a native of their own country, they have let all the rest of mankind enjoy the benefit of his services, without turning them to any advantage at home. In some parts of Africa, therefore, where the horse runs wild, the natives seem to consider him rather in the light of a dainty for food, than a useful creature, capable of assisting him either in war or labour: riding seems a refinement that the natives of Angola or Caffraria have not as yet been able to attain to; and whenever they catch a horse it is only with an intent to eat him.

But of all countries in the world, where the horse runs wild, Arabia produces the most beautiful breed,

the most generous, swift, and persevering. They are found, though not in great numbers, in the deserts of that country; and the natives use every stratagem to take them. Although they are active and beautiful, yet they are not so large as those that are bred up tame; they are of a brown colour, their mane and tail very short, and the hair black and tufted. (Marm. Descript. de l'Afrique, lib. i. p. 51.) Their swiftness is incredible; the attempt to pursue them in the usual manner of the chase, with dogs, would be entirely fruitless. Such is the rapidity of their flight, that they are instantly out of view, and the dogs themselves give up the vain pursuit. The only method, therefore, of taking them, is by traps, hidden in the sand, which, entangling their feet, the hunter at length comes up, and either kills them or carries them home alive. If the horse be young, he is considered among the Arabians as a very great delicacy; and they feast upon him while any part is found remaining; but if, from his shape or vigour, he promises to be serviceable in his more noble capacity, they take the usual methods of taming him, by fatigue and hunger, and he soon becomes a useful domestic animal.

To enumerate and enlarge upon the various breeds of horses, peculiar to different countries, would far exceed the space allowed in a work of this nature. We shall, therefore, conclude this brief sketch with a few words on the horses of our own country.

It is not without great assiduity, and unceasing application, that the English horses are now become superior to those of any other part of the world, for size, strength, swiftness, and beauty. It was not without great attention, and repeated trials of all the best horses in different parts of the world, that we have been thus successful in improving the breed of this animal; so that the English horses are now capable of performing what no others could ever attain to. By a judicious mixture of the several kinds, by the happy difference of our soils, and by our supe-

rior skill in management, we have brought this animal to its highest perfection. An English horse, therefore, is now known to excel the Arabian in size and swiftness, to be more durable than the Barb, and more hardy than the Persian. An ordinary racer is known to go at the rate of a mile in two minutes; and we had one instance, in the admirable Childers, of still greater rapidity. He has been frequently known to move above eighty-two feet and a half in a second, or almost a mile in a minute: he has run also round the course of Newmarket, which is very little less than four miles, in six minutes and forty seconds. But what is surprising, few horses have been since found that ever could equal him; and those of his breed have been remarkably deficient.

SANDS OF THE DESERT.

In the pathless desert, high mounds of sand, shifting with every change of wind, surround the traveller on every side, and conceal from his view all other objects. There the wind is of a surprising rapidity, and the sand so extremely fine, that it forms on the ground waves which resemble those of the sea. These waves rise up so fast, that in a very few hours a hill of from twenty to thirty feet high is transported from one place to another. The shifting of these hills, however, does not take place on a sudden, as is generally believed, and is not by any means capable of surprising and burying a caravan while on the march. The mode in which the transposition of the hills takes place is not difficult of explanation. The wind sweeping the sand from the surface continually, and that with an astonishing rapidity, the ground lowers every moment: but the quantity of sand in the air increasing as quickly by successive waves, cannot support itself there, but falls in heaps, and

forms a new hill, leaving the place it before occupied level, and with the appearance of having been swept.

It is necessary to guard the eyes and mouth against the quantity of sand which is always flying about in the air; and the traveller has to seek the right direction, to avoid being lost in the windings made in the middle of the hills of sand which bound the sight, and which shift from one spot to another so often, as not to leave any thing to be seen beside the sky and sand, without any mark by which the position can be known. Even the deepest footstep in the sand of either man or horse disappears the moment the foot is raised.

The immensity, the swiftness, and the everlasting motion of these waves disturb the sight both of men and beasts, so that they are almost continually marching as if in the dark. The camel gives here a proof of his great superiority; his long neck, perpendicularly erected, removes his head from the ground, and from the thick part of the waves; his eyes are well defended by thick eye-lids, largely provided with hair, and which he keeps half shut; the construction of his feet, broad and cushion-like, prevents his treading deep into the sand; his long legs enable him to pass the same space with only half the number of steps of any other animal, and therefore with less fatigue. These advantages give him a solid and easy gait, on a ground where all other animals walk with slow, short, and uncertain steps, and in a tottering manner. Hence the camel, intended by nature for these journeys, affords a new motive of praise to the Creator, who in his wisdom has given the camel to the African, as he has bestowed the rein-deer on the Laplander.

PILLARS OF SAND.

The following is Bruce's account of this singular phenomenon, which he represents as one of the most magnificent spectacles imaginable, and by which

himself and his companions were at once surprised and terrified. Having reached the vast expanse of desert which lies to the west and north-west of Chendi, they saw a number of prodigious pillars of sand at different distances, at times moving with great celerity, and at others stalking on with a majestic slowness. At intervals the party thought they should be overwhelmed by these sand pillars; and small quantities of sand did actually more than once reach them. Again, they would retreat so as to be almost out of sight, their summits reaching to the very clouds. There the tops often separated from the bodies; and these, once disjointed, dispersed in the air, and did not appear more. They were sometimes broken near the middle, as if struck with a large cannon-shot. About noon they began to advance with considerable swiftness upon the party, the wind being very strong at north. Eleven of them ranged alongside, at about the distance of three miles from them; and at this interval the greatest diameter of the largest of them appeared to Mr. Bruce to be about ten feet. They retired with a wind at south-east, leaving an impression on our traveller's mind, to which he could give no name, though assuredly one of its ingredients was fear, blended with a considerable portion of wonder and surprise. It was in vain to think of fleeing: the swiftest horse, or fastest-sailing ship, would not have been of any use in rescuing him from his danger. The full persuasion of this riveted him as it were to the spot where he stood, and he allowed the camels to gain on him so much, that it was with difficulty he could overtake them.

On a subsequent occasion, an assemblage of these moving pillars of sand, more numerous, but less in size than the former, approached Mr. Bruce's party soon after sun-rise, and appeared like a thick wood. They almost darkened the sun, the rays of which, shining through them for nearly an hour, gave them

an appearance of pillars of fire. His people became desperate, some saying it was the day of judgment—and others, that the world was on fire.

Dr. Clarke, in his more recent travels in Egypt, thus describes this phenomenon.

One of those immense columns of sand, mentioned by Bruce, came rapidly towards us, turning upon its base as upon a pivot: it crossed the Nile so near us, that the whirlwind by which it was carried placed our vessel upon its beam-ends, bearing its large sail quite into the water, and nearly upsetting the boat. As we were engaged in righting the vessel, the column disappeared. It is probable that those columns do not fall suddenly upon any particular spot, so as to be capable of overwhelming an army or a caravan; but that, as the sand, thus driven, is gradually accumulated, it becomes gradually dispersed, and the column, diminishing in its progress, at length disappears. A great quantity of sand is no doubt precipitated as the effect which gathers it becomes weaker; but, from witnessing such phenomena upon a smaller scale, it does not seem likely that the whole body of the sand is at once abandoned.

THE SPHYGMOMETER.

A Dr. Herisson, of Paris, has made an important discovery in medicine. He has invented an instrument which he calls a sphygmometer, the property of which is to expose to the eye the action of the pulse, the strength of which it measures, while at the same time it developes the system and all the anomalies. Experience has shewn the exactitude and utility of this instrument, which allows the physician to calculate the action of the heart, and extend his experienced assistance in the most difficult cases.

THE SAFETY LAMP.

THE invention of the wire-gauze-safe-lamp, for preventing explosions from fire-damp, and for giving light in explosive atmospheres, is due to Sir. Humphrey Davy, who remarks that the dreadful accidents of explosions are occasioned by the firing of light carburetted inflammable gas, which is disengaged during the working of the coals, and from fissures in the strata; and which, when it has accumulated so as to form more than 1-13th part of the volume of the atmospherical air, becomes explosive by a lighted candle, or by any kind of flame. The apertures in the gauze should not be more than 1-20th of an inch square. As the fire damp is not inflamed by ignited wire, the thickness of the wire is not of importance, but wire from 1-40th to 1-60th of an inch in diameter is the most convenient. If the wire of 1-40th is found to wear out too soon in practice, the thickness may be increased to any extent; but the thicker the wire the more the light will be intercepted, for the size of the apertures must never be more than 1-20th of an inch square. In the working models which he has sent to the mines, there are 748 apertures in the square inch.

When the wire-gauze-safe-lamp is lighted and introduced into an atmosphere gradually mixed with fire-damp, the first effect of the fire-damp is to increase the length and size of the flame. When the inflammable gas forms as much as 1-12th of the volume of the air, the cylinder becomes filled with a feeble blue flame, but the flame of the wick appears burning brightly within the blue flame, and the light of the wick continues till the fire-damp increases to 1-6th or 1-5th, when it is lost in the flame of the fire-damp, which in this case fills the cylinder with a pretty strong light. As long as any explosive mixture of gas exists in contact with the lamp, so long it will give light, and when it is extinguished, which happens when the

foul air constitutes as much as 1-3d of the volume of the atmosphere, the air is no longer proper for respiration. In cases of which the fire-damp is mixed only in its smallest explosive proportion with air, the use of the wire-gauze-safe-lamp, which rapidly consumes the inflammable gas, will soon reduce the quantity below the explosive point; and it can scarcely ever happen, that a lamp will be exposed to an explosive mixture containing the largest proportion of fire-damp: but even in this case the instrument is absolutely safe; and should the wires become red hot, they have no power of communicating explosion. Should it ever be necessary for the miner to work for a great length of time in an explosive atmosphere by the wire-gauze-safe-lamp, it may be proper to cool the lamp occasionally by throwing water upon the top, or a little cistern for holding water may be attached to the top, the evaporation of which will prevent the heat from becoming excessive.

DEPOSIT OF IRON ON ROADS.

It has been calculated by an engineer of eminence, that every four-horse coach deposits twelve pounds of iron in every one hundred miles of its journey, and that, consequently, assuming the number of such coaches passing daily between London and Birmingham alone to be twenty, the weight of iron deposited during every transit exceeds 250lbs. These results, it is stated, are not conjectured, but derived from investigations applied to the horse-shoe and the tire of the wheel—in the first instance, previously to use; and, in the second, after the wear and tear of the road had rendered them useles: and they have been found, it is added, as to every ton weight of iron so tried, nearly uniform.

LARGEST BELL IN EUROPE.

THE great bell at Erfurt is reckoned the largest in Europe, weighing upwards of twelve tons, being near 11 feet in height, and about as many yards in circumference. We are told the sound of this bell may be heard at the distance of 24 miles, which does not appear utterly improbable.

THE ROARING CASCADE, JAMAICA.

IN St. Anne's parish, Jamaica, is a very remarkable cascade, or, more properly speaking, cataract, formed by the White river, which is of considerable magnitude, and, after a course of about 12 miles among the mountains, precipitates itself in a fall of about 300 feet or more, obliquely measured, with such a hoarse and thundering noise, as to be heard at a great distance. Viewed from below, the adjutage appears to be a body of water, of small bulk, issuing between a tuft of wood: but as it continues its descent, the breadth gradually increases, until it reaches the bottom, where it forms a beautiful circular basin, and then flows away in a serpentine course towards the sea. Through the whole descent it is broken and interrupted by a regular climax of steps, of a stalactitic matter, incrusted over a kind of soft chalky stone, which yields easily to the chisel. So vast a discharge of water, thus wildly agitated by the steepness of the fall, dashing and foaming from step to step, with all the impetuosity and rage peculiar to this element, exhibits an awful, pleasing scene. But the grandeur of it is astonishingly heightened by the fresh supplies which it receives after the rainy seasons. At such times, the roaring of the flood, reverberated by the adjacent rocks, trees, and hills; the tumultous violence of the torrent, tumbling headlong with resistless fury: and the gloom of the overhanging wood, contrasted with

the soft serenity of the sky, the silvery glitter of the spray, the flight of birds skimming over the lofty summit of the mountain, and the placid surface of the basin below, form altogether an assemblage of subjects, the most happily mingled, and beyond the power of painting to express.

ANIMAL MAGNETISM.

THIS master-piece of palpable deception was introduced into the world by Father Hebl, at Vienna, about 1774. This wicked juggler not only imposed on some learned Germans, but also on several persons in other countries; by a pretended mode of curing all manner of diseases, by means of *sympathetic affection* between the sick person and the spectator or operator. The effect on the patient was supposed to be produced, or depended on certain motions of the fingers and features of the operator; he placing himself immediately before the patient, whose eyes were to be fixed on his. After playing in this manner on the imagination and enfeebled mind of the sick, and performing a number of *apish grimaces*, the cure was said to be completed.

This delusive mode of cure, as might naturally be expected, is now abandoned, but the world has paid vast sums to the knavish quacks who promoted it; not less than £100,000 are said to have been realized by one Deston, of Germany, by this imposture. To somewhat similar delusion may be attributed the momentary popularity of Graham's celestial bed, Mainaduc's lectures and operations in animal magnetism, and the metallic tractors; all of which have fortunately passed away, to the great disgrace of their inventors and supporters. Many of these impositions were not merely deceptive but grossly licentious and immoral, particularly in what the animal magnetizers of Paris called the *crisis* or convulsion in women.

FLIGHT OF BIRDS.

It is supposed that the flight of the swallow when emigrating, is not less than 50 miles an hour; so that when aided by the wind, they soon reach warmer latitudes. Sparlauzani calculates that the swallow can fly at the rate of 92 miles an hour, and that of hawks and several other tribes to be 150 miles!

BRASS MORTAR, TEN FEET IN LENGTH.

On the ramparts of Brunswick is a curious brass mortar-piece, (made in 1411,) which measures 10 feet in length, and 9 in diameter. It requires fifty-two pounds of gunpowder to charge it; and will throw a bomb of one thousand pounds' weight. It is also asserted that this extraordinary piece will carry a ball of seven hundred and thirty pounds' weight to the distance of thirty-two thousand paces.—Smith's *Wonders.*

EFFECTS OF THE SEA UPON IRON.

Iron after remaining a long time submerged in the sea is converted into *plumbago.* As an evidence of this change, M. Endes Desclougchamp has lately presented to the Linnæan Society, of Normandy, some cannon-balls, taken from the bottom of the sea off Cape la Hague, which were sunk with the ships under Admiral Tourville, in 1692. They do not, at first sight, appear to have undergone any change; but when examined, are found to have lost two-thirds of their weight, and may be scraped or cut with a knife, like black lead. They contain no remains of their ferruginous qualities, and have not the least effect upon the loadstone or magnetic needle!

THE BEE,

COMMONLY kept in hives in Britain, is an insect so well known, that it would be superfluous to enter into a minute description of it; let us, however, search into its instinctive faculties, its industry, its economy, and regularity of government, which have supplied naturalists for so many years with a rational, pleasant, and instructive amusement.

Many of their qualities, however, continue undiscovered, owing to the secret manner in which their domestic economy is conducted, for although various contrivances have been made, by glass hives, &c. yet their wax soon renders them almost invisible.

These insects associate together in great numbers, forming a community, where every one contributes to the welfare of the whole. Every hive is composed of three sorts, the neutral bees, which form the principal of the whole, and are neither male nor female; their business is to perform all the labour of the hive, and provide sufficient food for the young: secondly, the drones, which are one-third larger than the former; these are the males, and of these there are not above a hundred in a hive of several thousand bees; thirdly, the queen bees, or females, who lay all the eggs; of these it has been generally believed that there is but one to each hive, but later observers have enumerated five or six.

From the mouth of the bee proceeds a long trunk or tongue, that licks the fluid up which it collects. It is also furnished with teeth, which assist in making its wax. This substance is that fine dust or farina found in the cups of flowers, which the insect gathers by rolling itself within the flower, when this dust clings to its body and is afterwards brushed off with its hind legs and kneaded into balls. The stomach is divided into two parts, one for the honey and the other for the wax. The sting is composed of the small darts, each of which is armed with several

points or barbs, and a sheath, which by means of its sharp point makes the first impression, and is immediately followed by the dart or sting, by which it introduces the poison collected in the venom bag.

The wax is formed in the stomach from the fine powder or farina collected from the flowers by being swallowed, digested, and concocted into real wax, and is then again ejected by the same passage by which it was swallowed. There is also a large portion of this powder kneaded together for food in every hive, serving for winter provision, and vulgarly known by the name of bee-bread. The honey is collected and formed in the second division of the stomach; this matter is gathered from that part of the flower called the nectarium, and, after passing into the stomach or honey-bag, it is disgorged into one of the cells in the hive; though sometimes the animal delivers it to one or other of the society at the mouth of the hive, and returns back to the fields for a fresh supply. To a superficial beholder the bees appear in constant confusion, but more minute observation proves that the greatest order prevails, and that each office is performed as if by a machine put in motion by one moving power.

The bees swarm twice, sometimes three times in one season, the first of which is the principal, the rest being generally too small for preparing food and stocking a hive to endure the winter, therefore two or three swarms are occasionally put together, but this is sometimes attended by the destruction of the whole, either in combat or by want of food; at other times they unite into one family without trouble or discord. When the swarm has taken possession of its new hive, they form themselves into companies, generally four, one of which traverses the fields for materials, another is occupied in laying out the bottoms and partitions of the cells, the third finishes the cells and smooths the insides, and the fourth either brings food for the rest, or relieves those who return

with their burthens; the same bees, however, do not continue always in the same employ, but change occasionally. In one day's time they will construct cells enough for the reception of three thousand bees, allowing one cell for each bee. These cells are perfect hexagons, those in every honeycomb being double, opening on each side and closing at the bottom. The cells for their young are carefully formed; those designed for the drones are somewhat larger, and that appropriated to the queen bee is the largest of all. Their habitations being finished, their next care is to provide for posterity: and it is somewhat astonishing, that the whole brood of young ones very often derive their origin from a single queen bee. This single female sometimes gives birth to upwards of twenty thousand young in the course of one summer. This will not appear astonishing if we dissect the body of the queen bee, where are often found eggs to the amount of five thousand at one time. The queen bee is discovered from the rest of the hive by her superior size, her majestic deportment, and by the large retinue that attend her, and which are supposed to be the males, they are larger and blacker than the rest, have no stings, nor any work or balls on their legs; they come down from the hive about eleven o'clock on a fine day, flutter about, making a harsher noise than the working bees, and then commonly retire about twelve. The queen bee, attended by these males, goes from cell to cell, depositing an egg in each. In a day or two after these eggs are laid, the young insect protrudes itself through the shell, appearing in the form of a maggot. The working bees now intermit their labours to attend the rising progeny, which they guard with the utmost care, and in less than six days the young maggot arrives at its full growth, when it refuses the proffered food, and is then immersed by the old ones in its cell, which is performed by closing up the mouth thereof with wax. In this state the young animal is transformed in the

manner of a caterpillar, and in the space of about twenty days from the time the egg is first laid, the bee is completely formed and able to undergo the fatigues of its future life. It is no sooner freed from its cell in a perfect form, than several officious bees flock round it, some licking it clean with their trunks, another assiduously feeding it with honey, and a third begins to clean the cell it has just left.

When the young swarm is ready for its departure, all business is interrupted the preceding evening. And the next day the queen bee conducts them to a new habitation.

The most astonishing piece of policy among these creatures is, that towards the latter end of summer, as soon as they have ceased from labour, the working bees attack the drones (the number of which in a hive is generally about a hundred) and destroy them; this destruction is performed in a few days.

Another piece of policy occurs in the spring among them, that is, as soon as the warmth has invigorated them so as to labour, they appoint a watch at the door of the hive, at first of one bee, and as the season advances, the number is increased to seven or nine, some lying on their backs in or near the port, fluttering their wings, while others are parading in and out of the door, and in case of any apprehension of danger, they make a particular noise, on which several bees make their appearance from the body of the hive, and if the noise increases, they continue accordingly to advance in greater numbers, in order to render any assistance in their power against intruders, and enemies, such as mice, spiders, hornets, other bees, &c.

TRAVELLING BEES.

Amongst the many barks that float on the river Nile, numbers are seen, loaded with bee-hives—one above another in a pyramidal form. It is two months since these hives have been sent into Upper

Egypt, where clover and sainfoin flourish better than in the Delta; the travelling bees who have thus got the start of spring, sojourn for some weeks in the plains of Thebes and Montfalút; they then come down the Nile; and stop in the fayum covered with roses, and every place where lands rich in flowers afford them booty; at the end of March they return to the Delta, and their hives are plundered of their richness and sold!

THE ESCURIAL.

THIS palace is so called from a little village of that name, in the neighbourhood of which it stands, about 22 miles from Madrid. Including the monastery, church, college, library, and other buildings, it is the most magnificent in the kingdom, and is reckoned by the Spaniards the eighth wonder of the world. The whole pile of building is a vast square, about 3,000 feet in circumference, all of fine grey stone, dug out of a neighbouring mountain, and so well polished that it looks like marble. The windows of the four fronts, including those in the pavilions at each corner, amount to upwards of 1,100; but those within are computed at as many thousands. The principal front faces the west, having three noble gates, especially that in the middle, which leads to the church, a large and beautiful structure, built in imitation of St. Peter's at Rome. It is 364 feet long, 230 broad, and of a proportionable height. The roof, which is finely gilt and painted, is supported by columns of the Doric order, dividing it into six stately aisles, with 48 chapels and altars, besides the grand one at the east end, which is extremely magnificent. The tabernacle of the great altar is of porphyry, wrought with the point of a diamond; it is made in the form of a cupola, supported by eighteen columns of agate, and adorned with gold and precious stones. The altar itself is of fine black

marble; and the wall behind it is lined with a square piece of porphyry, which reflects all the objects in the church as plain as a looking-glass. Here are a great number of statues of saints, &c., of excellent workmanship, and several of the smaller sort of gold and silver. The paintings, which are said to amount to 1,600, are large, and executed by the most eminent masters. Under the grand chapel is a large mausoleum or burying-place for the royal family, which is called the Pantheon, being a rotunda, built after the manner of that temple at Rome. The descent consists of more than fifty marble steps, and the gate that opens into it is of brass gilt, and of very curious workmanship. The dome is lined with jasper, intermixed with small plates of brass, and the pavement is likewise composed of squares of jasper and marble. Facing the entrance is a kind of chapel, or oratory, adorned in the most sumptuous manner imaginable, particularly with a crucifix enriched with diamonds and other precious stones. In the middle of this noble vault is a large brazen candlestick, supported by figures of angels, and the four Evangelists, of the same metal; and in 26 niches, embellished with the richest ornaments, are placed as many urns or sepulchres of black marble, destined to receive the remains of the Spanish monarchs. The royal apartments, or what may be properly called the palace, are large and stately, furnished in the most magnificent manner, and adorned with every thing that is rich and beautiful. Throughout the whole, an attentive spectator must observe a variety of marble, jasper, and other curious stones, carved by the best masters, and in the grandest taste; and all the halls, galleries, stair-cases, &c., are filled with excellent paintings, together with a profusion of fine hangings, plate, and other costly furniture. The monastery consists of five courts, or squares, one larger than the rest, each of them adorned with a marble fountain. The grand cloister, which is 210 feet square, is paved

with black and white marble, as are likewise the walks of the garden within it; and at the bottom of it is a beautiful chapel, in form of a dome, open on all sides, and supported by marble columns. The refectory, or hall, where the monks take their meals, is very long, and adorned with fine paintings, amongst which there is one representing Charles V. and Philip II. carried to heaven by angels. Here are also several infirmaries for the sick, two grand apartments to entertain strangers, nine kitchens, forty subterraneous rooms for offices of divers kinds, and eleven cisterns that will hold 200 tuns of water. The college, where a number of young students are maintained at the king's expense, is a very handsome building; and the noble library is perfectly correspondent with the rest of this edifice. It contains a fine collection of books and manuscripts in all languages and sciences, disposed in a very elegant manner, the shelves being neatly carved, and made of the choicest sorts of Spanish or Indian wood. The floor is beautifully paved with marble; and the ceiling is adorned with appropriate paintings. But to give an adequate idea of the surprising grandeur of this palace, it is proper to observe, that, according to the computation of Francisco de los Santos, it would take up more than four days to go through all its rooms and apartments, the length of the way being reckoned 33 Spanish leagues, which is above 120 English miles. Alvarez de Colmenar also asserts, that there are 14,000 doors and 11,000 windows belonging to this edifice.

NATURAL PHENOMENON.

In the memoirs of the Imperial Academy of St. Petersburgh (1820) it is stated, that in the district of Gori, in Russia, at the foot of the Ossetin mountains, there is a hill, on the stony surface of which the humidity that exudes from the rock, in summer

and in fine weather, is converted into ice of a thickness proportionate to the heat of the sun! This ice disappears in the night, or during cloudy weather, so completely, that the rock is scarcely damp. The water obtained from this ice when melted, appears, upon analysis, to contain a small quantity of lime, which is doubtless the *cause* of the phenomenon.

THE SHARK.

Of all the inhabitants of the deep, those of the shark kind are the fiercest and the most voracious. The smallest of this tribe is not less dreaded by greater fish than many that to appearance seem more powerful; nor do any of them seem fearful of attacking animals far above their size: but the great white shark, which is the largest of the kind, joins to the most amazing rapidity, the strongest appetites for mischief: as he approaches nearly in size to the whale, he far surpasses him in strength and celerity, in the formidable arrangement of his teeth, and his insatiable desire of plunder.

The white shark is sometimes seen to rank even among whales for magnitude; and is found from twenty to thirty feet long. Some assert that they have seen them of four thousand pounds' weight; and we are told particularly of one, that had a human corpse in his belly. The head is large and somewhat flatted; the snout long, and the eyes large. The mouth is enormously wide, as is the throat, and capable of swallowing a man with ease. But its furniture of teeth is still more terrible; of these there are six rows, extremely hard, sharp-pointed, and of a wedge-like figure. It is asserted that there are seventy-two in each jaw, which make a hundred and forty-four in the whole; yet others think that their number is uncertain; and that in proportion as the animal grows older, these terrible instruments of destruction

are found to increase. With these the jaws both above and below, appear planted all over; but the animal has a power of erecting or depressing them at pleasure. When the shark is at rest, they lie quite flat in his mouth; but when he prepares to seize his prey, he erects all his dreadful apparatus, by the help of a set of muscles that join them to the jaw; and the animal he seizes, dies, pierced with a hundred wounds, in a moment.

Nor is this fish less terrible to behold as to the rest of his form: his fins are larger in proportion; he is furnished with great goggle eyes, that he turns with ease on every side, so as to see his prey behind him as well as before; and his whole aspect is marked with a character of malignity; his skin also is rough, hard, and prickly; being that substance which covers instrument-cases called shagreen.

As the shark is thus formidable in his appearance, so he is also dreadful from his courage and activity. No fish can swim so fast as he; none so constantly employed in swimming: he outstrips the swiftest ships, plays round them, darts out before them, returns, seems to gaze at the passengers, and all the while does not seem to exhibit the smallest symptoms of an effort to proceed. Such amazing powers, with such great appetites for destruction would quickly unpeople even the ocean; but providentially the shark's upper jaw projects so far above the lower, that he is obliged to turn on one side (not on his back, as is generally supposed) to seize his prey. As this takes some small time to perform, the animal pursued seizes that opportunity to make its escape.

Still, however, the depredations he commits are frequent and formidable. The shark is the dread of sailors in all hot climates; where, like a greedy robber, he attends the ships, in expectation of what may drop overboard. A man who unfortunately falls into the sea at such a time, is sure to perish without mercy. A sailor, that was bathing in the Mediterranean, near

the Antibes, in the year 1744, while he was swimming about fifty yards from the ship, perceived a monstrous fish making towards him and surveying him on every side, as fish are often seen to look round a bait. The poor man, struck with terror at its approach, cried out to his companions in the vessel to take him on board. They accordingly threw him a rope with the utmost expedition, and were drawing him up the ship's side, when the shark darted after him from the deep, and snapped off his leg.

Mr. Pennant tells us, that the master of a Guinea-ship, finding a rage for suicide prevail among his slaves, from a notion the unhappy creatures had, that after death they should be restored again to their families, friends and country; to convince them at least that some disgrace should attend them here, he ordered one of their dead bodies to be tied by the heels to a rope, and so let down into the sea; and, though it was drawn up again with great swiftness, yet in that short space the sharks had bit off all but the feet. Whether this story is prior to an accident of the same kind, which happened at Belfast, in Ireland, about 20 years ago, I will not take upon me to determine; but certain it is, there are some circumstances alike in both, though more terrible in that I am going to relate. A Guinea captain was, by stress of weather, driven into the harbour of Belfast, with a lading of very sickly slaves, who, in the manner above-mentioned, took every opportunity to throw themselves overboard when brought up upon the deck, as is usual, for the benefit of the fresh air. The captain, perceiving, among others, a woman slave attempting to drown herself, pitched upon her as a proper example to the rest. As he supposed that they did not know the terrors attending death, he ordered the woman to be tied with a rope under the arm-pits, and so let down into the water. When the poor creature was thus plunged in, and about half way down, she was heard to give a terrible shriek, which at first was ascribed

to her fears of drowning; but soon after the water appearing red all around her, she was drawn up, and it was found that a shark, which had followed the ship, had bit her off from the middle.

Such is the frightful rapacity of this animal, nothing that has life is rejected. But it seems to have a peculiar enmity to man; when once it has tasted human flesh, it never desists from hunting those places where it expects the return of its prey. It is even asserted, that along the coasts of Africa, where these animals are found in great abundance, numbers of the Negroes who are obliged to frequent the waters, are seized and devoured by them every year. The people of these coasts are firmly of opinion that the shark loves the black man's flesh in preference to the white; and that when men of different colours are in the water together, it always makes choice of the former.

The shark so much resembles the whale in size, that some have injudiciously ranked it in the class of cetaceous fishes: but its real rank is the place here assigned it, among those of the cartilaginous kind. It breathes with gills and lungs, its bones are gristly, and it brings forth several living young; Bellonius assures us, that he saw a female shark produce eleven live young ones at a time. But I will not take upon me to vouch for the veracity of Rondeletius, who, when talking of the blue shark, says, that the female will permit her small brood, when in danger, to swim down her mouth, and take shelter in her belly. Mr. Pennant, indeed, seems to give credit to the story, and thinks that this fish, like the opossum, may have a place fitted by nature for the reception of her young. To his opinion much deference is due, and it is sufficient, at least, to make us suspend our assent; for nothing is so contemptible as that affectation of wisdom which some display, by universal incredulity.

Upon the whole, a shark, when living, is a very formidable animal; and, when dead, is of very little

value. The flesh is hardly digestible by any but the Negroes, who are fond of it to distraction; the liver affords three or four quarts of oil; some imaginary virtues have been ascribed to the brain; and its skin is, by great labour, polished into that substance called shagreen. Mr. Pennant is of opinion that the female is larger than the male in all this tribe; which would, if confirmed by experience, make a striking agreement between them and birds of prey. It were to be wished that succeeding historians would examine into this observation, which is offered only as a conjecture.—*Goldsmith's Animated Nature.*

THE STADTHOUSE, AMSTERDAM.

THE Stadthouse of Amsterdam is not only the most magnificent in the United Provinces, but is generally thought to surpass any thing of the kind in Europe. This superb edifice is all freestone, built upon 13,659 piles, driven into the ground close to each other; and the first stone was laid on the 28th of October, 1648. It is a square building, 282 feet in length, 235 in depth, 90 feet high in front, and 160 to the top of the cupola. It has above 400 windows, and is adorned with a great number of pilasters of the Corinthian order. On the pediment in the centre of the front is an admirable piece of sculpture in relievo, representing the city of Amsterdam under the figure of a woman sitting in a chair, supported by two lions, and holding on her knee the arms of the city. In her hand she has an olive branch, the emblem of peace; and is attended by sea-nymphs, who present her with crowns of palm and laurel. Here are also represented Neptune and his tritons, with several water-animals; the whole in marble, and the workmanship extremely curious. At each side and on the top of this pediment are placed three brazen statues, representing Justice, Fortitude, and Prudence; and behind it is a hand-

some dome or cupola, containing a great number of bells, which compose very musical chimes. In the front of the stadthouse are seven doors, or open arches, alluding to the seven provinces of the republic. The back front of the building has also a pediment, with an excellent bas-relief in marble, representing the extensive commerce of Amsterdam, under the emblem of a woman with a winged cap on her head, to whom the four parts of the world (denoted by proper figures) offer presents of their respective productions. On the sides of the pediment are the statues of Peace and Plenty, and on the top stands a large Atlas with a globe of copper on his shoulders. The inside of this stately fabric is decorated with a profusion of fine paintings, sculptures, and other ornaments. The courts of judicature are lined with marble, and adorned with curious emblematical figures or historical pieces, relating to the distribution of justice; particularly a representation of Solomon passing judgment between the two harlots; and at the entrance of every office or chamber is some sculpture or other appropriate decoration.

A flight of stairs leads to the great hall, at the entrance of which are two strong folding-doors of brass, and several marble columns 20 feet high, supporting a most beautiful cornice. Over this cornice sits the figure of a woman bearing on her breast the city arms, while an eagle places on her head an imperial crown. At her feet are two lions; on one side is a statue of Fortitude, and that of Minerva on the other; and four naked children hover round her with cornucopias, pouring out fruits and flowers. The beauty and magnificence of this hall are hardly to be described; the stately marble pillars, the representation of the four elements at the corners, the exquisite paintings, statues, and other ornaments, at once surprise and charm the spectator: but the greatest curiosity is the marble floor, on which the celestial and terrestrial globes are represented in planisphere; the

constellations in the one, and the several parts of the earth in the other, with the principal circles, being all delineated in brass, neatly laid into the marble, and the names of the countries expressed in a similar manner. Each hemisphere is about 22 feet in diameter, and the whole is universally admired, as a most ingenious performance. This structure cost three millions of guilders, or £300,000 sterling, when money was much more valuable than it is at present.—SMITH'S *Wonders.*

WONDERS OF THE CAMELEON.

THIS singular little animal is thus noticed by Mr. Madden, in the account of his Travels in Turkey, &c. 'I had a cameleon, which lived for three months, another two months, and several which I gave away after keeping them ten days or a fortnight. Of all the erascible little animals in the world there are none so choleric as the cameleon; I trained two large ones to fight, and could at any time, by knocking their tails against one another, insure a combat, during which their change of colour was most conspicuous. This is only affected by paroxysms of rage, when the dark gall of the animal is transmitted into the blood, and is visible enough under its pellucid skin. The gall, as it enters and leaves the circulation, affords the three various shades of green, which are observable in its colours—the story of the cameleon assuming whatever colour is near it is, like that of its living upon air, a fable. It is extremely voracious: I had one so tame that I could place it on a piece of stick opposite a window, and in the course of ten minutes I have seen it devour half-a-dozen flies. Its mode of catching them is very singular: the tongue is a thin cartilaginous dart, anchor-shaped; this it thrusts forth with great velocity, and never fails to catch its prey. The mechanism of the eyes

of the cameleon is extremely curious; it has the power of projecting the eye a considerable distance from the socket, and can make it revolve in all directions. One of them, which I kept for some months, deposited 13 eggs in a corner of a room; each was about the size of a large coriander-seed; the animal never sat on them. I took them away to try the effects of the sun, but from that period she declined daily in vivacity, and soon after died.

WONDERFUL INVENTION.

A WATCHMAKER, of the name of Buschmann, living at Eisenberg in Saxony, has contrived a piece of machinery, which, without the assistance of steam, has been found strong enough to move a heavily laden waggon, placed in a fresh-ploughed field, with the greatest ease, although sixteen horses could not stir it. The machine may be easily handled, and the vehicle moved by it most safely managed. The inventor has been offered 200,000 dollars for the secret; but as he had obtained patents from all the principal German governments, he has refused all offers.

THE ANT.

THIS emblem of industry, so universally esteemed by the ancients, has some properties which make it curious and interesting. Ants, like bees, are divided into three natural genera, male, female, and neuter; they are of various sizes and sorts, some of them have stings, while others are without; these revenge themselves on their enemies by spurting from their posteriors a sharp pungent fluid, which inflames and irritates the skin like the sting of a nettle. The male and female sorts are furnished with four wings, with which the neutral kind is not pro-

vided, although destined to construct their nests, or ant-hills, with much assiduity and skill.

It was generally believed that the ant laid up store in the summer to support itself during the winter; this might be the case in warm countries, but the assertion is not true with regard to European ants, for they live in a state of torpidity during the winter; the provision, therefore, which they lay by, is only to support them during the summer months, and partly to serve as an ingredient in constructing their habitations. As soon as the warm weather commences, the ants are awakened from their torpid state, and immediately set about repairing the injuries their habitation has sustained through the winter; this work is entirely carried on by the neutrals. The ant-hill is constructed with less symmetry in Britain than in the more southern parts of Europe. It is generally in the form of a sugar-loaf, and composed of leaves, bits of wood, sand, earth, gum, or grains of corn, which are all united into a compact solid body, perforated with galleries from the top to the bottom, and subdivided by various winding ways. The hill is always near a tree, to which there are several beaten paths, worn by the constant passing and repassing of these creatures to the tree for food. The laborious ants are almost constantly employed in providing food for the colony, which consists of almost any vegetable or animal that lies within their reach: they are particularly fond of flesh, and devour beetles, may-bugs, frogs, lizards, fruits, &c. When a single ant happens to discover any animal or food, it immediately communicates the news to the rest of the tribe, and a sufficient number sally forth to bring home the spoil, which, if it be an insect or small animal, they attack it with all their violence, and generally succeed in killing, dividing it, and carrying home the parts; but if their numbers be inadequate to the combat, they go for a reinforcement, and then again return to the charge; when they cannot easily

divide their booty, they all assist in dragging it home, some being employed in pulling it, while others push it behind. While they are thus busily employed in providing food, they are not unmindful of their rising progeny; for the queen ant having laid her eggs, withdraws to a separate apartment, leaving the care of her young brood to the labouring ants, who immediately carry them to the bottom of the hill to the safest situation, where they are defended from every injury.

The queen ant is easily distinguished from the rest by her superior size, the diversity of her colour, and the attention paid to her by her subjects; she has also three lucid spots on her forehead, placed in a triangular form. It is this animal which furnishes the whole colony with inhabitants; for this purpose she lays three different sorts of eggs, namely, the male, female, and the neuter. The egg or larva from which the ant is produced is so very small, that it is at first hardly discernible to the naked eye, but when viewed through a microscope, it appears smooth, polished, and glossy. The labouring ants attend the rising generation with the utmost care. In cold weather they carry them in their mouths to the lowest retreats in their habitation, to secure them from the cold; and when the weather is fine, they bring them nearer the surface, to enjoy a greater portion of air and the warmth of the sunbeams. If their hills should be molested, the first care of the old is to protect the young, and they may be seen running about the nest in a state of distraction, each carrying a young one frequently as big as itself.

The egg of the ant is first turned into a maggot, in which state it is often taken for the egg itself; when grown to maturity, it bursts the surrounding folds and assumes its adult form. The old ones, however, generally assist the young animal in freeing it from its confinement, by tearing with their teeth the covering with which it is enwrapped, without which the

young one would not be able to set itself at liberty. The old ones also instinctively know the precise time this is to be performed, which were it delayed too long, the young insect would be suffocated, and if effected too soon, it would perish with cold. When the female has laid all her eggs her wings disappear, and what becomes of her afterwards is not certainly known. The males having no further employment at home, fly away and never return. Some imagine that they perish with the cold, while others think they are devoured by the birds. The labouring part of the tribe having thus disposed of their queen, and being freed from the incumbrance of the males, prepare for the severity of the winter by making a deep retreat into the earth, where they remain in a torpid state till the returning warmth of the succeeding spring. Ants swarm once a year, when the young ones build new habitations without the assistance of the old, and live together, notwithstanding their numbers, in perfect peace and social concord. These insects are given by the Wise Man as an example of industry. Proverbs vi. 6. &c.

DROPPING WELL AT KNARESBOROUGH.

This dropping well, or petrifying spring, rises at the foot of a limestone rock, at an inconsiderable distance from the bank of the river Nidd. The spring, after running about sixty feet, divides, and spreads itself over the top of the rock, whence it trickles very fast, from thirty or forty places, into a channel hollowed for the purpose, each drop producing a musical kind of tinkling, probably owing to the concavity of the rock, which, bending in a circular projection, from the bottom to the top, occasions its brow to overhang about fifteen feet. This rock, which is about thirty feet in height, forty-eight in length, and from thirty to fifty in breadth, started, in the year 1704, from

the common bank, and left a chasm, from five to nine feet wide, over which the water passes by an aqueduct formed for the purpose. It is clothed with evergreens and other shrubs, which add greatly to the beauty of this very interesting scene.

The water is said to abound with fine particles of a nitrous earth, which it deposits, but when in a languid motion only, and leaves its incrustations on the leaves, moss, &c. which it meets with, in trickling thus slowly through the cavities of the rock. This spring is estimated to send forth twenty gallons of water in a minute. Here are to be seen pieces of moss, birds'-nests, with their eggs, and a variety of other objects, some of them very curious, which have been incrusted or petrified by the water.

BROSELEY SPRING.

THIS celebrated boiling Spring, or Well, at Broseley, in Shropshire, was discovered in the month of June, 1711. It was first announced by a terrible noise in the night, there having been a remarkable thunder-storm. Several persons who resided in the vicinity having been awakened in their beds by this loud and rumbling noise, arose, and proceeding to a bog under a small hill, about two hundred yards from the river Severn, perceived a surprising commotion and shaking of the earth, and a little boiling up of water through the grass. They took a spade, and digging up a portion of the earth, the water immediately flew up to a great height, and was set on fire by a candle which was presented to it. To prevent the spring from being destroyed, an iron cistern has been placed over it, provided with a cover, and a hole in the centre, through which the water may be viewed. If a lighted candle, or any burning substance, be presented to this aperture, the water instantly takes fire, and burns like spirit of wine, continuing to do so as

long as the air is kept from it; but on removing the cover of the cistern, it quickly goes out.

HOT SPRINGS OF ST. MICHAEL.

In the eastern part of this island, or one of the Azores, is a round deep valley surrounded by high mountains, in which are many hot springs; but the most remarkable is that called *The Caldeira*, situated in the eastern part of the valley, on a small eminence by the side of a river, on which is a basin about thirty feet in diameter, where the water continually boils with prodigious fury. A few yards distant from it is a cavern in the side of a bank, in which the water boils in a dreadful manner, throwing out a thick, muddy, unctuous water, several yards from its mouth, with a hideous noise. In the middle of the river are several places where the water boils with so intense a heat, that a person cannot dip his finger into it without being scalded. On its banks are several apertures, out of which the steam rises to a considerable height, and is so hot that it cannot be approached by the hand. In other parts, the spectator would be led to suppose that the bellows of a hundred forges are blowing in concert; while sulphureus streams issue out in a thousand places. The bushes even, near these spots, are covered with pure brimstone, condensed from the steam which issues from the ground. In the small caverns whence the steam issues, many of the inhabitants prepare their food.

THE MILK TREE OF SOUTH AMERICA.

We have in a former part of this work, given a short account of the properties of this tree; but, as the following is more at length, we have thought proper to insert it. *The Palo di Vaca*, which flourishes in

Para, is among the loftiest of the forest, growing to the height of a hundred feet and upwards. It bears a delicious edible fruit, which has the united flavour of strawberries mixed with cream, and its trunk yields as fine bowls of milk as those from a cow! It may appear improbable, but such is the fact, and it is drunk by the people in large quantities, and was used by the officers at the gun room table for mixing with tea, in lieu of cow's milk, from which it is no ways distinguishable in general use. The milk has a rich, white, bland fluid, without odour, and of the taste and flavour of common milk. It mixes readily with tea or coffee, without curding or undergoing any change, and in every respect seems like cow's milk. Boiling water does not alter it. It keeps unaltered six or seven days in the temperature of 85°. It appears to differ from all the known milky juices of plants, and to approach in obvious properties to animal milk, from which it differs widely in chemical composition. There is no cream or caseous (cheesy) matter. It was kept for eight or ten weeks in a bottle at Trinidad, when it separated into a sourish milky water and a white solid mass, which when taken out and dried in the sun, was a white inflammable substance, not softening at the temperature of the body, melting at 143°, tasteless, insoluble in water or spirits, and resembling white wax more than any other substance to which I could compare it. It burned with a light agreeable flame, without smell, and was neither greasy nor rosinous; and it must be therefore considered as a kind of wax. To complete the marvels of this tree, we must mention, that it affords the most valuable timber for ship building, and that it is so used in the dock yard at Para.

WATER.

THE law of Nature respecting the effect of temperature upon Water, is one of the most extraordinary instances of the regulation of a beneficent Providence. The general law, to which water is the exception, is this—that all substances gradually expand, or increase in bulk, by the acquisition of heat, and condense, or contract, by the deprivation of heat. Water like other substances, condenses or contracts while its temperature is sinking to 39½ Farenheit's thermometer, but it will condense no further. Once it gets to 39½ you increase its bulk by making it either hotter or colder. At 32 it becomes ice, but ice occupies more space than the water of which it is composed, and hence the bursting of our water-pipes in frosty weather. We may, perhaps, not discern the bounty of Providence in our plumber's bill, but if we consider that the same law which causes the water-pipe to burst prevents the most delightful parts of the world from becoming a lifeless frozen lump, we may nevertheless be thankful. If water like other substances, became smaller by freezing, its specific gravity would be increased, and each particle of ice as it formed would sink; new particles of water would then be at the surface, would be frozen, and would sink in their turn, until all deep waters, in countries where frosts occur, would become a solid mass, which all the heat of the summer could not dissolve. Every fish would die, and the land would become uninhabitable. But, by the singular provision of ice increasing in bulk, and, consequently, becoming lighter than water, it floats on the surface, and, being a bad conductor of heat, it preserves the water beneath from the freezing effect of the air.

The vapour of water is the foundation of the manufacturing eminence of England. Its wonderful properties give us the steam engine, and all the magnificent results of that extraordinary machine. Mr.

Watt discovered that a cubic inch of water would form about 1728 cubic inches of steam, and that the condensation of this steam back again, would heat six cubic inches from the atmospheric temperature to the boiling point. Upon these main facts all the subsequent powers of the steam engine are founded.

When water is heated over the fire, a simmering sound is produced, which is ascribed to the vibrations occasioned by the current of the heated water at the bottom rushing upwards, and the cooler coming down to take its place. The heat goes on increasing until it comes to 212; then ebullition takes place, and the water in the vessel will get no hotter. Where, then, does the heat go which is passing from the fire? It combines with the water at 212, and forms steam which flies off as fast as it is formed.

WATER-SPOUTS.

Water-spout observed in the Mediterranean, by Alexander Stuart.—August 27th, 1701, being on the coast of Barbary, to the northward of the town of Bona, upwards of ten leagues distance at sea, about seven o'clock at night, soon after sun-set, there appeared in the north-east, which was directly up the Gulf of Lyons from us, great and continued flashes of lightning, one after another with hardly any intermission, and this without thunder; it continued till the next morning, the flashes of lightning sometimes representing the sudden appearance of a star, and at other times of a flaming sword, and again of a silver cord stretched along the clouds, or as the irregular rents of a phial from top to bottom. About eight next morning, we had thundering, with a continuation of lightning of the kind and appearance as before, all from the north-east, or nearly so.

About nine the same morning, there fell down from the clouds, which looked black, lowering, and, as it

were, heavy with rain, in the north-east, three water-spouts; that in the middle, being the greatest, seemed as large as the mast of a ship, and I judge it to be at least a league and a half distant from us—so that in itself it was, doubtless, larger than three masts: the other two were not half the size. All of them were black, like the cloud from whence they fell—and smooth, without any knot or irregularity; only at first falling, some fell perpendicularly down, and some obliquely, and all of them smaller at the lower end than above, representing a sword; sometimes, also, one of them would bend, and become straight again, and also sometimes become smaller, and again increase its bulk; sometimes it would disappear, and immediately fall down again; at other times it became extenuated to the smallness of a rope, and again became as gross as before.

There was always a great boiling, and flying up of the sea, as in a *jet d'eau*, or water-work; or this rising of the water had the appearance of a chimney smoking on a calm day. Some yards above the surface of the sea, the water stood like a pillar, and then spread itself, and was dissipated like smoke; and the sword-like spout from the clouds either came down to the very middle of this pillar, as if it had been joined with it, as the largest pillar, which fell perpendicularly down, always did from the beginning to the end; or else it pointed to this column of water, at some distance, either in a perpendicular or oblique line, as did the two other lesser ones. There were three or four spouts more, which appeared at the same time in the same quarter of the heavens; but not like the three former either for bulk or duration. These last appeared and disappeared several times during the continuance of those three aforesaid.

It was hardly distinguishable whether the sword-like spout fell down from the cloud, or the pillar of water rose first from the sea, both appearing opposite to each other all of a sudden; only I observed of one

of them, that the water boiled up from the sea to a great height, without the least appearance of a spout pointing to it, either perpendicularly or obliquely; and here the water of the sea never came together in the form of a pillar, but rose up scatteredly, the sea boiling furiously round the place. The wind being then north-east, the said boiling advanced towards the south-west, as a flitting or moving bush on the surface of the sea, and at last ceased. This shows that this boiling, or flying up of the water of the sea, may begin before the spout of the cloud appears; and, indeed, if there be any small matter of priority between these two appearances, the boiling or throwing up of the sea has it, which first begins to boil, and then forms itself into a pillar of water, especially on the lower part.

It was observable of all of them, but chiefly of the large pillar, that, towards the end, it began to appear like a hollow canal, only black in the borders, and white in the middle; and, though at first it was altogether black and opaque, yet one could very distinctly perceive the sea-water to fly up along the middle of this canal, as smoke does up a chimney, and that with great swiftness, and a very perceptible motion; and then soon after the spout or canal burst in the middle, and disappeared by little and little. The boiling up and the pillar-like form of the sea-water continuing always the last, even for some considerable time after the spout disappeared, and perhaps till the spout appeared again, or re-formed itself, which it commonly did in the same place as before, breaking and forming itself again several times in a quarter or half an hour.

I know not if any one has accounted for this phenomenon; but I imagine it may be solved by suction, or rather pulsion, as in the application of a cupping-glass to the flesh, after the air is first exhausted by the kindled flame.

It was further observable, that the oblique spouts

pointed always from the wind; that is, that the wind being at north-east, the oblique spouts always pointed to the south-west, though at the same time there were others perpendicular, which still continued so notwithstanding the wind. Also, that such as were curved, had always the convex side from the wind, and the concave towards it; that is, the wind being at north-east, the concave was towards the north-east, and the convex was towards the south-west. It rained a great deal during the continuance of these spouts; and, after their total disappearance, there was half an hour's violent storm from the north-east with very little rain; but afterwards the weather cleared up.—*Philosophical Transactions*, 1702.

THE PRINTING MACHINE.

WITHIN the last quarter of a century a great improvement has been achieved in the printing department, by the invention of the printing machine. The greatest number of impressions which two men can strike off with the common press seldom exceeds two hundred and fifty an hour; and, formerly, the work was very laborious, when there was nothing but wooden presses, and when the laying of the ink upon the type was performed by two unseemly balls, made of sheep skins, and stuffed with wool. The wooden presses, however, have long been superseded by various improved iron ones, and the balls have given way to composition rollers, which, combined, makes the press work comparatively easy from what it used to be.

Such being the state of the press department of printing, not only in England, but throughout the world, the invention of the printing machine is a most important discovery. As several approaches had been made before the time of Faust to the principle of printing books from moveable types, so the prin-

ciple of producing impressions from a cylinder, and of inking the types by a roller, which are the great principles of the printing machine, had been discovered in this country as early as the year 1790. In that year Mr. William Nicholson took out a patent for certain improvements in printing, the specification of which clearly shows that to him belongs the first suggestion of printing from cylinders. But this inventor, like many other ingenious men, was led astray by a part of his project which was highly difficult, if not impracticable, to the neglect of that portion of his plan which, since his time, has been brought into the most perfect operation. Nicholson's patent was never acted upon. The first maker of a printing machine was Mr. Koenig, a native of Saxony; and the first sheet of paper printed by cylinders, and by steam, was the 'Times' newspaper of the 28th of November, 1814. The machine thus for the first time brought into action was that of Mr. Koenig.

Before we proceed to a description of the printing machine, or take a view of its general effects upon the diffusion of knowledge, let us imagine a state of things in which the demand for works of large numbers should have gone on increasing, while the mechanical means of supplying that demand had remained stationary—had remained as they were at the beginning of the present century. Before the invention of stereotyping it was necessary to print off considerable impressions of the few books in general demand, such as bibles and prayer-books, that the cost of composition might be so far divided as to allow the book to be sold cheap: with several school-books, also, it was not uncommon to go to press with an edition of 10,000 copies. Two men, working eight hours a-day each, would produce 1000 perfect impressions (impressions on each side of a sheet) per day; and thus if a book consisted of twenty sheets, (the size of an ordinary school-book, one press would produce the twenty sheets in 200 days. If a printer, therefore, were en-

gaged in the production of such a school-book, who could only devote one press to the operation, it would require very nearly three quarters of a year to complete 10,000 copies of that work. It is thus evident, that if the work were to be published on a given day, it must begin to be printed at least three-quarters of a year before it could be published; and that there must be a considerable outlay of capital in paper and in printing for a long time before any return could be expected. This advance of capital would have a necessary influence on the price of the book, in addition to the difference of the cost of working by hand as compared with working by machinery; and there probably the inconvenience of the tedious progress we have described would stop.

But take a case which would allow no time for this long preparation. Take a daily newspaper, for instance, of which great part of the news must be collected, and written, and printed within twenty-four hours. Before the application of machinery to the printing of newspapers, in 1814, there were as many daily London newspapers as at present; but their average size was much smaller than those now published. The number of each paper printed was less than at present; and the later news was much more incompletely given. The mechanical difficulties of printing a large number within a limited time required to be overcome by arrangements which involved considerable expense; and thus less capital was left to be expended upon that branch of the outlay by which the excellence of a newspaper is mainly determined,—namely, the novelty, the completeness, and the accuracy of its intelligence. Let us take for example, the 'Times' newspaper for some years prior to 1814, when it began to be printed by machinery. When that paper was originally established, somewhere about forty years ago, the present system of reporting speeches in parliament on the same night that they were spoken was

scarcely ever attempted. A few lines mentioning the subject of the debate, and the names of the principal speakers, were sometimes given; but anything like a sketch of the general debate, or a report of any remarkable speech, was deferred to a future day, if it were published at all. Mr. William Woodfall, the son of the celebrated printer of the 'Public Advertiser,' in which the letters of Junius first appeared, undertook, without any assistance, the arduous task of reporting the debates of both Houses of Parliament, day by day, in his father's paper, and afterwards in other daily journals. This person possessed a most extraordinary memory, as well as wonderful powers of literary labour. It is asserted that he has been known to sit through a long debate of the House of Commons, not making a single note of the proceedings, and afterwards to write out a full and faithful account of what had taken place, extending to sixteen columns, without allowing himself an interval of rest. The remarkable exertions of this most famous of reporters gave the newspapers for which he wrote a celebrity which compelled other newspapers to aim at the same fullness and freshness in their parliamentary reports. What Woodfall accomplished by excessive bodily and mental exertion, his contemporaries succeeded in bringing to a higher degree of perfection by the division of labour; and thus in time each morning newspaper had secured the assistance of an efficient body of reporters, each of whom might in turn take notes of a debate, and commit a portion of it to the press several hours before the whole debate was concluded. Perfect as these arrangements had become at the beginning of the present century, it is manifest that during the session of Parliament at least, when newspapers are most interesting, their circulation must have been necessarily limited by the mechanical difficulties of their production. We must explain this a little more in detail. A newspaper being made up of many dis-

tinct articles, does not require, as a book does, that the whole of the types of which it is composed should be set up before one side of it is printed off. The outer side of a daily paper, which ordinarily consists of advertisements, communications, and paragraphs of minor importance, may be printed off some hours before the inner side, which contains the later news, is ready to be printed. Such an arrangement of course would prevent the whole paper being filled with the latest news, as is now frequently the case; and thus all the papers printed before the invention of the machine will be found to be constructed with reference to this principle of having one half printed long before the other half is ready to be printed. But let us see how that half, which contained the last intelligence, was brought out previously to 1814. If we refer to such a paper containing a report of any great parliamentary debate, we shall find the speeches generally given of a length not proportioned to their importance, but to the time of the evening in which they were delivered. Those reporters to whose share the earliest speeches fell gave them fully, because there was time for printing them; and this fullness left little space for the more important speeches which at that period generally closed the debate. The quality of reporting was therefore injured by the brevity required for all speeches delivered after midnight. Without this sacrifice the paper could not have been published at all on the day whose date it bore; and even with this sacrifice the difficulty of meeting the demand was excessive. The only mode in which it could be met was by setting up a portion of the paper in duplicate,—that is, setting up two sets of types, so that two presses might be engaged in printing it off at the same time. Sometimes in large papers such as the 'Times,' a page only was worked at one press, to enable the pressmen to proceed with great speed. If the House of Commons now sits to four o'clock, and the 'Times,'

or the 'Chronicle,' or the 'Herald,' cannot be ready for printing off till six o'clock at the earliest, the papers are nevertheless published, so that the country and the town may be supplied without intermission. In such a case, before the introduction of the printing machine, the morning coaches would have departed without a paper, and the people of London would have received them at the hour of dinner instead of that of breakfast. The printing press, as we have mentioned, will, at the ordinary rate, enable two men to take off two hundred and fifty impressions in an hour. By the most violent exertions, the pressmen of a daily newspaper were enabled, with relays, to work off about five hundred copies in an hour. One press would therefore produce ten thousand copies in about twenty hours. It is manifest, that such a rate of speed, if such a quantity were demanded, would be incompatible with the production of a daily paper, the condition of whose existence is that it must be wholly printed and issued in four and twenty hours. Let us double the speed by printing in duplicate; and we find that ten thousand copies can be produced in about ten hours. But even this rate carries the publication of several thousands of the ten thousand printed into the next afternoon. We may, therefore, assume that without triplicates, which we believe were never resorted to, no daily paper previous to 1814 could aim at the sale of a greater number of copies than could be printed off even with duplicates in six hours—of which number the publication would often not be complete till after mid-day. The number printed of the most popular daily paper, would therefore be limited to five thousand; and this number could not be produced in time without the most perfect division of labour aiding the most intense exertion, provided that paper were printed by hand. The 'Times' newspaper now produces ten thousand copies in two hours and a half, from one set of types.

We now come to a more difficult part of our task, that is, giving a description of the machine; but we will endeavour to do it as clearly as we can. The Rigger is a wheel revolving upon a shaft which is turned by the steam engine, to which is attached an endless strap for transmitting the motion of the Rigger to the machine. The "Dead" and "Live Riggers" are two wheels, the former one moving freely on its axis without connexion with any part of the machine, and upon which the endless strap is slipped when it is desirable to stop it; and the other (the outer one) turning on a spindle, which passes horizontally beneath the bed of the machine, and which carries two small cogged wheels for communicating the motion of the strap to all parts of the machine. The first of these, called the driving pinion, lies immediately alongside the dead rigger, and by turning the first great cogged wheel, puts the whole of the printing cylinders, drums, &c. in motion. The second, called the *upright* bevilled wheel, is borne on the end of the pinion, and is situated midway under the bed of the machine; this bevilled wheel, through the intervention of an *horizontal* bevilled wheel, a sliding rack, and some other contrivances, gives to the bed or table of the machine upon which the type rests, an *horizontal motion backwards and forwards*. The inking apparatus consists of a inking table, which is supplied by a vibrating roller, which, as it rises, touches another roller called the *Doctor*, thickly covered with ink from the reservoir, against which it is placed, and, as it touches it, carries off by contact a portion of the viscid ink along its whole length; it then descends, and for a moment slightly pressing itself upon the end of the table, leaves on it a portion of the ink which it had previously taken from the doctor. This ink is then spread over the surface of the table by three inking rollers, and afterwards taken from it and distributed over the face of the type by two or three other rollers. In the

apparatus for printing, there are seven cylinders; they are called the web roller, the smoothing roller, the entering drum, the first impression cylinder, the first and second paper drums, and the second impression cylinder. The sheet of white paper is placed by the "laying-on boy" on what is called the web, on the top of the machine, and from this by a number of clasps the sheet is caught and carried under the smoothing roller, where it is closely bound to the entering drum, by *five endless tapes*, through the following operations. It is carried round the entering drum and delivered to the first impression cylinder, where, in passing under it, it receives on one side, by a rolling pressure, the impression of the first forms of type; it is then carried by the tapes *over* the first, and *under* the second paper drums, to the second impression cylinder, where it is "perfected," or printed on the remaining blank side, and thrown out to the "taking-off-boy," who sits waiting to receive it.

Most of the large book offices in London have these machines, some of which have as many as sixteen in one office.

EXTRAORDINARY CAVE.

We subjoin an accurate description of the extraordinary cavern lately discovered on the estate of Lord Kingsborough. We have heard that many gentlemen of respectability from various parts of the country, have visited this 'stupendous subterranean palace.' And so attractive have the accounts of its beauties and wonders been, that it is becoming the resort of the learned antiquarian and the naturalist, as well as of the curious. The following account is from a correspondent of the *Tipperary Free Press*.

This cave, which was discovered a short time ago, at Coolagarranroe, is now considered a great natural

curiosity. Some labourers were quarrying stones on these lands, (which are part of Lord Kingsborough's estate) and about twenty feet from the surface of the quarry, they discovered the mouth of the cave. It has been since visited by persons of all ranks from various parts of the country, and according to my view of the cave, it may be divided into six apartments.

The entrance, which is in the centre of a limestone quarry, is only four feet wide, and with a ladder of fourteen feet you arrive at the landing place; from this there is a gentle descent of about twenty feet more. Here a large space opens to the view, which is about forty feet square, by sixteen or seventeen feet high. The rocks forming the arch over head are finely wild, pointed and irregular. The next curiosity is the water-hall, in which a variety of spars, in the form of shells, icicles, &c., may be seen. In the middle cave there are four crystallized pillars, extending from the floor to the top of the cavity, one of which could not be spanned by four men; one of those pillars (about five feet from the ground), branches off into three separate parts, but at the top it is one solid piece. Another of the pillars, in like manner, has an interstice in the middle, of four or five feet long, but it is one piece at the top and bottom. On touching these pillars with a cane they sound like bell metal: in this division also we find spars or stalactites interspersed in the most picturesque forms, one of them in particular is of a large size, and resembles a beehive; at a little distance farther on there is a solid piece of the same material, in the form of a table, which measures twelve feet by six in breadth, and near it there are three handsome pillars of a small size.

The entrance to the upper or garret cave is rather difficult, for you must go through a narrow passage between four pillars, and here again there is a large space about fifty feet square and twenty high. The

arching of this division is formed of rocks in their full dimensions, arranged in rude and terrible magnificence, and the spars are formed into large sheets resembling curtains and drapery extending from the top to the floor—on touching them with a stone or cane their sound is pretty clear. It is called the upper cave, because it is singularly placed higher than the one just mentioned. The Cellar Cave is so called from its low situation. In this divison, at the right, there is a curious pillar—an immense solid spar as white as snow. Coming back to the Cellar Cave you are carried to the brink of a precipice, where, if you dare approach it, a new scene of astonishment presents itself—a rivulet is to be seen at the depth of twenty feet at least. This rivulet cannot he less than 100 feet from the surface or level of the quarry above. The lower cave, like the other divisions, is firmly arched (in horrible grandeur) with rocks, which, in all probability, are as old as time. The place called the Sand Hill is narrow, and presents nothing new to the eye; it is so called because the floor is for the most part composed of sand, and must have been formerly a water-course, and it is likely that the whole of this place was some years ago a water-course. At the end of this there is a wide space, at the right and left of which there are circular holes that communicate with small apartments, which are of minor importance.

The grand hall is also narrow; it is not more than 4½ feet wide; but the rocks over head are firmly knit together. I have called it the grand hall in consequence of the liberal and humane Lord Kingsborough having honoured the cave with his presence on the 4th of June. His lordship was the first who explored the remotest part of this hall, and in doing so he was obliged to break through a thin partition of spar which intercepted his passage. Immediately adjoining Kingsborough Hall are other curiosities. There is a well of clear water about five feet in circumfer-

ence, which has not been dry since the cave was discovered, and two cataracts that run through tubular spars, which make an agreeable murmuring noise that can be heard at a distance. In all these divisions or apartments of the cave, to which I have given appropriate names, the stalactites and spars are moulded into shapes as varied and fantastic as may be imagined. Some are formed like sugar-loaves—others like chandeliers, honey-combs, clusters of grapes, &c., and besides all those, some specimens of the five orders of architecture (the Doric, Ionic, Tuscan, Composite, and Corinthian) may be seen rudely formed by the hand of nature. Mr. Shealy, who accompanied me through the cave, picked up some very curious pieces, one of which resembled what anatomists call the *diploe*, or lamina, of the human skull. The antiquarian and the mineralogist would find in this cave a fine field for the exercise of their talents. It requires, however, some time and attention to view all the curiosities of the place; for I can assure the reader that I was walking and making observations, through the various apartments, during two hours and twenty minutes without intermission, so that I may (in reference to this cave) exclaim with great propriety, in the words of the sacred penman:—'As for the wondrous works of the Lord, there may be nothing taken from them, neither may anything be put unto them, neither can the ground of them be found out.'—Eccl. chap. xviii. verses 4, 5, 6. 'Thou art worthy, O, Lord, to receive glory and honour, and power, for thou hast created all things, and for thy pleasure they are made and were created.'—Rev. iv. 2.

I would recommend gentlemen who may have a wish to see the cave, to come prepared with coarse clothes—such as a fustain jacket, gray Russia-duck trousers, strong shoes or boots, a seal-skin cap, or a felt hat; they should also have some candles, for the cave cannot be seen, as may be easily guessed, without candle or torch light. It is to be observed, that

when the candles are lighted, the scene is uncommonly solemn; new prospects present themselves by the reflection of the light on the spars and pillars rising in successive ranges till the eye is lost in an agreeable perplexity. I have heard that some ingenious persons who visited the cave discovered marcasites of a tolerable good description among the rocks, such as are found in the mines of Cornwall. It is somewhat remarkable that the 'Gray Sheep's Cave,' which is so well known, and which has been so often visited during the last century, is about 200 perches from this place I have been describing. The proprietor of the farm endeavoured to find a passage from one to the other, but he failed in the attempt.

ROMAN AMPHITHEATRE AT NISMES.

NISMES, anciently called Nemausis, in the province of Lower Languedoc, was a very flourishing colony of Romans established by Augustus Cæsar, after the battle of Actium. Among its splendid monuments of antiquity, the Amphitheatre, being infinitely better preserved than those of Rome and Verona, is the finest monument of the kind now extant. It was built in the reign of Antoninus Pius, who contributed a large sum of money towards its erection. It is of an oval figure, 1080 feet in circumference, sufficiently capacious to contain twenty thousand spectators. The architecture is of the Tuscan order, sixty feet high, composed of two open galleries, built one over another, consisting each of sixty arcades. The entrance into the arena was by four great gates, with porticos; and the seats, of which there were thirty, rising one above another, consisted of great blocks of stone, many of which still remain. Over the north gate, appear two bulls, in alto relievo, extremely well executed, emblems which, according to the usage of the Romans, signified that the amphitheatre was

erected at the expense of the people. In other parts are heads, busts, and other sculptures in bas-relief.

This magnificent structure stands in the lower part of the city, and strikes the spectator with awe and veneration. The external architecture is almost entire in its whole circuit. It was fortified as a citadel by the Visigoths, in the beginning of the sixth century: they raised within it a castle, two towers of which are still extant; and surrounded it with a broad and deep moat, which was filled up in the thirteenth century. In all the subsequent wars to which the city of Nismes was exposed, it served as the last refuge for the citizens, and sustained a great number of successive attacks; so that its fine preservation is almost miraculous.

RIVERS IN ENGLAND.

THE THAMES.

WHAT a delightful ornament to a country is the winding course of a river! How much more exquisitely enchanting does it render the most beautiful landscape! and of what an unspeakable variety of benefits is it productive to the countries through which it flows! Hence rivers, in all their diversities of scenery, ever appear a favourite theme in poetical composition. Sir John Denham, in his poem of Cowper's Hill, gives the following fine description of the river Thames; the sweetness of the lines in which the simile is conveyed, have been objects of admiration, and perhaps of envy, by every succeeding poet.

Thames the most lov'd of all the ocean's sons
By his old sire, to his embraces runs;
Hasting to pay his tribute to the sea,
Like mortal life to meet eternity.
Nor are his blessings to his banks confin'd,
But free and common as the sea or wind;

Where he, to boast or to disperse his stores,
Full of the tribute of his grateful shores,
Visits the world, and in his flying tow'rs
Brings home to us, and makes both Indies ours;
So that to us no thing, no place is strange,
While his fair bosom is the world's exchange.
O! could I flow like thee, and make thy stream
My great example, as it is my theme.
Though deep, yet clear; though gentle, yet not dull;
Strong without rage, without o'erflowing full.

The source of the Thames, this first of British rivers, is derived from a copious spring called Thames Head, near the village of Tarlton, about two miles west of Cirencester, and is contiguous to the fosseway leading to Somersetshire.

The name of this river has long been matter of controversy, even among the learned, on whom we ought to rely. The vulgar appellation it bears above Oxford is Thame-Isis, evidently formed from a combination of the words Thame and Isis. How this river obtained the latter name, or at what period, we cannot learn.

Although it is the current opinion that the Thames had its name from the conjunction of the Thames and Isis, yet it is always called Thames before it comes near the Thame. This the annotator on Camden proves from ancient records, and adds, "it may be safely affirmed, that it does not occur under the name of Isis in any shorter or authentic history, and that the name is nowhere heard of, except among scholars; the common people all along, from the Spring-head to Oxford, calling it by no other name than that of the Thames."—IRELAND'S *Picturesque Views, and Gallery of Nature and Art.*

THE SEVERN.

The Severn rises from a small lake on the red mountain of Plynlimmon, in Montgomeryshire, and is the principal beauty of the country, in which it receives so many small streams, that it becomes na-

vigable near the town of Montgomery. It passes through the middle of Shropshire; on its banks are the towns of Shrewsbury and Bridgeworth; its course is through the centre of Worcestershire, from north to south, the city of Worcester and town of Tewkesbury being here seated on its margin. Entering Gloucestershire, it runs through the city of Gloucester, and discharges itself into a large bay, which, from the commercial city in its vicinity, is called the Bristol Channel. About 15 miles from its mouth a navigable canal has been constructed, which conveys the water of the Severn to within about two miles of Cirencester; it is then carried by a tunnel or archway, the height of which is 15 feet above the surface of the water, through Sapertoo hill, two miles and three furlongs in extent, for the purpose of communicating with the Thames at Lechlade. In November, 1789, this navigation was completed. The Severn is distinguished for the abundance of salmon which frequent it, and the lamprey, which is almost peculiar to it; this last fish is in season in the spring of the year, when it has a delicious taste which abates as the season advances.—*Gallery of Nature and Art.*

THE TRENT.

The Trent rises among the moorlands in the north-west part of Staffordshire, and has its waters increased by several rivulets, by the Sow, Charnet, Eccleshell-water, and other streams, and then runs to the eastward. It becomes navigable at Burton-upon-Trent, where it leaves this country, and flowing through those of Derby, Nottingham, and Lincoln, discharges itself into the Humber, that great receptacle of the northern rivers, running a course of near 200 miles. It enters Nottinghamshire at the south-west point, where it is joined by the Erwash, and passes to the eastward till it reaches Newark, where it forms an island; when turning to the north, after a track of about 14 miles,

it forms the boundary of that county on the side of Lincolnshire. Poets have derived the name of this river from *thirty* kinds of fishes which are found in it, and from *thirty* streams which flow into it:

> The bounteous Trent, that in himself inseams
> Both thirty sorts of fishes, and thirty sundry streams.

But this ought only to be considered as a poetical fiction. Mr. Pennant determines the name to be Saxon, and says it is derived from its rising from three heads. The Dove, which rises in the most northern point of Staffordshire, forms the boundary between it and Derbyshire, and joins the Trent a little below Burton. The Sow rises a few miles to the west of Newcastle-under-Line, and falls into the Trent on the South-east. These are well stocked with fishes, especially the trout. A canal has been formed from Chesterfield, in Derbyshire, which passing through the northern part of Nottinghamshire, communicates with the Trent just below Gainsborough; it was begun in 1773, and completed in 1775. In its course a subterranean tunnel is cut through Norwood-hill, which extends 2,850 yards, or upwards of a mile and a half, so perfectly straight, that the termination at one end may be seen at the other. The arch is twelve feet high, nine feet three inches wide, and in the deepest part 36 yards below the surface of the earth. By means of the numerous canals which are now formed in the north of England, a communication is opened between the Trent and the Mersey, or quite across the kingdom, from east to west.—*Gallery of Nature and Art.*

THE NEW RIVER.

This most noble undertaking, for the purpose of supplying the northern and western parts of the cities of London and Westminster, and nearly the whole of their environs, with that necessary of life, water, is by means of this river, which is conducted in an arti-

ficial canal, extending through a winding course of 38¾ miles, and sixteen poles, from the springs of Chadwell and Amwell, near Ware, in Hertfordshire. It was undertaken in the year 1606, by Mr. Hugh Middleton, citizen and goldsmith, of London, who was afterwards knighted, and at length created a baronet: but the title is now extinct. In about five years he had brought the water as far as Enfield, but having met with great difficulties, and strong opposition, he found himself extremely impoverished by the undertaking, and applied to the lord-mayor and corporation of London for assistance; but they refusing to be concerned, he made a more successful application to James I., who, in the year 1612, engaged to bear half the expense of the concern, on becoming a half partner in it; though the king was excluded from interfering at all in its management. The sums paid out of the exchequer at various times, from Easter, 1612, to September, 1614, in consequence of this covenant, were £6,347. In the following year, water was brought into the basin, called "The New River Head," at Islington. It was then thought to be an object worthy of national attention, and Sir Hugh Middleton dividing his moiety into thirty-six shares, sold twenty-nine of them.

It was not, however, until the year 1633, that any dividend of profit was made, and Sir Hugh died in the year 1631; the portion of each twenty-ninth share was, at that time, £11 19*s.* 1*d.*; the second dividend was only £3. 4*s.* 2*d.*: and instead of a third, a call upon the partners was expected to be made. Charles I., supposing little advantage would accrue from the undertaking, re-conveyed to Sir Hugh Middleton, in his life-time, the royal moiety, on condition of having secured to him and his successors a fee-farm rent of £500 per annum. This moiety was likewise divided into thirty-six shares, which were called "the King's shares," as the other twenty-nine were "the Adventurers'," who were incorporated, by letters patent, in

the year 1619, by the name of "The New River Company," and the government of the concern lodged in their hands.

In the year 1766, one of the king's shares was sold by public auction for £4,400; and in 1770, another king's share, or one seventy-second part of the whole, was purchased at a public auction for £6,700. The corporation consists of a governor, deputy governor, treasurer, and twenty-six directors; a collector and his assistant, a surveyor and his deputy, collectors, and workmen. The canal, called "The New River," is carried over two vales, in wooden frames, or troughs, lined with lead; in its course are 43 sluices, and over it are 215 bridges. In some parts it is conveyed through subterranean passages.

Sir Hugh Middleton left by his will, some of his shares to the Goldsmith's Company, to be divided among its poor members.

This adventurous baronet was possessed of mines in Cardiganshire, which he is said to have worked to so great advantage, as to have cleared £2,000 a month for several years together, which enabled him to bring the New River water to London; but Mr. Pennant says, that he expended the whole on that great object, and was so reduced, as to support himself by becoming an hireling surveyor. One of his female descendants, being in very reduced circumstances, was, not many years ago, voted a small annuity by the corporation of London, in consequence of a petition which she presented.—*Gallery of Nature and Art.*

THE HUMBER.

The Humber is formed at the confluence of the Ouse, and may rather be considered as a narrow bay than a river, being throughout its short course of an extreme width. Its whole extent to Spurnhead, a narrow peninsula which terminates Yorkshire to the south-east, does not exceed thirty-six miles.

THE RIVER NILE.

Mr. Bruce informs us, that the sources of the Nile are situated in the country of the Agows, in Abyssinia, and that the longitude of the principal fountain is thirty-six degrees fifty-five minutes thirty seconds east from Greenwich. The place through which is the passage to the territory of the Agows, is called Abala; a valley generally about half a mile, and never exceeding one mile, in breadth. The mountains which surround it are at first of an inconsiderable height, and covered to their very summits with trees and herbage, but as they proceed to the southward they become more rugged. Those to the west join a mountain called Asormaska, where they turn to the south, and enclose the territory of Sacala, which lies at the foot of them; and further to the westward is the small village of Geesh, where the fountains of the Nile are situated.

In order to know exactly the rise of the Nile, there is built, on a pleasant island opposite to Old Cairo, a place called the Makkias, in which is a famous pillar for measuring the Nile. It is fixed in a deep basin, the bottom of which is on a level with the bed of the river, the water passing through it. This pillar, which is placed under a dome, and crowned with a Corinthian capital, is divided into measures for observing the rise of the waters; and from the court that leads to the house is a descent to the Nile, by steps, on which the common people believe that Moses was found after he had been exposed on the banks of the river.

As the river cannot of itself overflow the lands every where in the necessary proportion, the people have cut, with incredible labour, a vast number of canals and trenches from one end of Egypt to the other, so that almost every town and village has its canal, which is opened at the proper time, and conveys the water of the Nile to distant places. It is

from these canals, where the banks of the Nile are high, that the lands are overflowed; but it is otherwise where they are low, particularly in the Delta, which is that part of Egypt that lies between the two mouths of the river.* Canals are carried along the higher grounds, that the water may have a fall from them to the lower parts; and from the great canals it is drawn out into small channels, and conveyed all over the country. It is likewise observable, that, as they have dikes or banks to keep the water out of the canals till the river be risen to a proper height to let it in, so in some of them they have contrivances to keep it in after the Nile is fallen, and also preserve it in certain lakes or ponds, from whence they can let it out upon their lands at pleasure.

The reader, however, is to understand, that some parts of the country lie too high to be watered by means of the canals, and several gardens and plantations require more refreshment than what they receive from the annual inundation; and on this account they are obliged to raise water from the river, which is lodged in cisterns or reservoirs contrived for that purpose. This is generally done by the Persian wheel, a machine turned by oxen, which carries a rope hung with several vessels, that fill as it goes round, and empty themselves at top into the reservoir. They have another contrivance where the bank of the river is high; in which case they make a basin on the side of it, fixing near it an upright pole, and across the top of that another with an axle, at one end whereof

* A little below Cairo, the Nile divides into two large branches, which empty themselves into the Mediterranean at a great distance from each other, one near Rosetta, the other near Damiata: and thus the country between them is shaped something like the Greek letter Delta, from whence its name. But as to the seven mouths of the Nile, much spoken of by the ancients, they are not to be found at present, time having made a great alteration in the face of the country.

hangs a great stone, and at the other a leathern bucket, which, being drawn down into the water by two men, is raised up again by the weight of the stone, the men directing it, and emptying it into the basin. The former of these machines is chiefly used in the lower parts of Egypt, the latter in the higher; for, as we advance up the river, the difficulty of raising the water increases.

We may judge how much the fertility of Egypt is owing to the inundation of the Nile, when we consider that it leaves behind it a stratum of mud or slime, which, without any other manure, renews all the strength of the soil that the preceding harvest had impaired; nay, it is frequently found necessary to temper it with a little sand, to abate its excessive richness. And here it is worth observing, that the surface of the ground must have been considerably raised, in a long course of years, by these repeated accessions of mud and slime, so that formerly a less rising of the Nile was sufficient to overflow the country than at present. As to the quantity of mud thus annually left by the river, it is a point not easy to determine; but Dr. Shaw supposes that the surface of the land of Egypt is thereby raised somewhat more than a foot in a hundred years; according to which computation, the perpendicular accession of soil from the deluge to the present time, must have been about forty-two feet. And hence the Doctor imagines, that in process of time the whole country may be reduced to the greatest barrenness, by being raised so high that the river will not be able to overflow its banks. But Dr. Pococke is of another opinion, as supposing that a great quantity of soil is annually carried off in the productions of the earth, (which in Egypt is not supplied by manuring) and that the bed of the Nile may be raised by the subduing of the heavier sandy particles; for which reason he thinks it impossible that the land will ever rise to such a height, as to be deprived of the usual inundations. He observes,

however, if that should ever be the case in Lower Egypt, the inhabitants would only be in the condition of those of Upper Egypt, who are obliged to raise the water by art and labour.

With respect to the distribution of the waters of the Nile by means of canals, &c., we shall only add, that there is a great canal called Khalis, which runs from the river quite through the city of Cairo, and several miles beyond it. Near the mouth of this canal there is a mound or mole, which is every year broken down with great solemnity and rejoicing, when the Nile rises to the height of sixteen peeks; and thereby the water is conveyed into the city, and from thence into the gardens, and the adjacent country. The bashaw himself, accompanied by all his great officers, and attended by a vast multitude of people, assists at the ceremony of cutting this bank; and on this occasion the trumpets and other music, the repeated shouts of the people, the firing of guns, &c., make an agreeable confusion. In short, bonfires, illuminations, fireworks, several sorts of games and exercises, and whatever can express an universal joy, are continued for three days and nights successively. M. Thevenot, who was twice present at this ceremony, tells us, that among other diverting sights exhibited on that occasion, he saw two swimmers, whose performances were very surprising. One of these, with his hands tied behind him, and his feet bound with a chain weighing ten pounds, stood upright in the water, and in that manner went from the opening of the canal quite through Cairo, which is three miles and upwards. The other fellow swam in chains from one end of the canal to the other, with a pipe in his mouth, and a dish of coffee in his hand, without spilling it; and both these swimmers were handsomely rewarded.—SMITH'S *Wonders*.

DEW.

ALL bodies have the property of transferring heat to others, in their neighbourhood. This is called radiation of heat, and by this property all bodies are endeavouring to maintain an equilibrium of temperature. Different bodies—according to their composition—the nature of their surface, and colour—have different radiating powers. Grass, wood, leaves of plants, and filamentous substances, generally radiate the heat much more quickly than smooth stones, polished metals, &c.; consequently, when the direct influence of the sun is removed in the evening, and the earth ceasees to receive heat, and from the ceaseless activity of heat to require an equilibrium, these substances give out their superfluous heat to the surrounding space, and the former substances, from their more perfect and radiating power, soon acquire a temperature much lower than that of the surrounding atmosphere, and by this cold the watery vapour of the atmosphere in the immediate neighbourhood is condensed into dew. Dew is only formed on cloudless and serene nights; if clouds exist at all it is not formed, because the heat is intercepted by them, and there is an interchange established; the heat transmitted from the clouds to the earth is equal to that radiated from the latter to the former. If there be no obstacle from the clouds, then the heat radiated from the earth is lost in free space, no return is made, and the condensation takes place. It was formerly supposed that a clear moonlight night favoured animal putrefaction by its own specific influence; this was erroneous, for it is by the deposition of the dew on the animal matter that decomposition is assisted; and as the dew is deposited on clear moonlight nights, the effect was attributed to the wrong cause.

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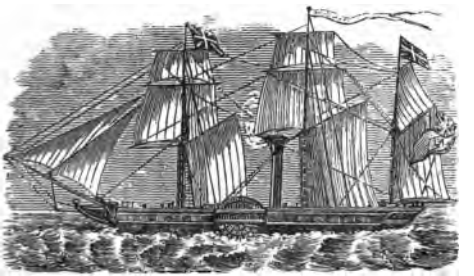

STEAM SHIP.

IRON SHIPS.

It has long been our opinion, that the prejudice against constructing floating vessels of iron, a material the specific gravity of which is considerably greater than that of water, would give way to the conviction that ships of that metal might be made, possessing the advantageous properties of superior lightness, strength, and durability, over any that could be constructed of wood. A beautiful vessel of this description has been built on the Mersey, near Liverpool, *entirely* of iron. She is 120 feet long, and 21 feet wide on the beam, and capable of bearing 280 tons burthen. She is propelled by steam power, and employed in the service of the Dublin and Liverpool Steam Packet Company; she is called the *Garryowen*, and is said to be superior to any vessel afloat. Messrs. Laird and Sons are the engineers.

There are many advantages connected with the construction of vessels of iron, instead of wood: among which may be enumerated the facility of repairing any accident arising from external violence, by carrying in the vessel a quantity of iron plates properly shaped and pierced with holes, and rivet bolts, ready to be employed immediately when any emergency occurs. There is also another point of great importance in connexion with iron vessels—they may be made with air chambers in all the vacant parts which would prevent the possibility of the vessel sinking, even if she were filled with water up to her gunwale edge. And the danger of being destroyed by fire at sea, is, by the incombustibility of the material, completely removed.

THE IRON EAST INDIAMAN.

Scarcely has the wonder created in the world by the appearance of the Great Western and British Queen steam ships begun to subside, when we are called upon to admire the rapid strides of enterprise

by the notice of an iron steam ship, the first of a line of steamers to ply between England and Calcutta. She is to be called "The Queen of the East." She is 2618 tons burthen, and 600 horses power. This magnificent vessel is designed by a Mr. Holmes, an engineer. When this gentleman first broached the subject to the Admiralty and elsewhere, they laughed at the idea, and begged of him to desist from pursuing so futile a plan. Nothing daunted by this notification, this spirited gentleman has persevered to completion, when the folk at the Admiralty and others admit their error, and congratulate the inventor on its success. When these vessels are ready, it is supposed that the voyage from Falmouth to Calcutta will be made in 30 days! whereas, by the ordinary sailing ships the voyage takes up the space of four months! and has never yet been performed in less than three months. The following are the dimensions:—extreme length, 310 feet; length of main deck, 282 feet; length between perpendiculars, 270 feet; length of principal cabin, 128 feet; number of private apartments for passengers, 16; number of beds for ditto, 400; width of beam, 45 feet; depth of hold, 30 feet; tonnage before enumerated; immersion at load water line, 15 feet; cylinder 84 inches diameter, and nine feet stroke.

THE GIANTS' CAUSEWAY,

On the N. W. of the county of Antrim, opening into the Atlantic, is a great natural curiosity; it consists of a vast collection of basaltic pillars, extending several miles along the coast, and divided into fragments or parts of causeways.

The chief causeway consists of a regular arrangement of millions of pentagonal and hexagonal columns, of basaltes, a deep grayish blue-coloured stone, harder than marble; the pillars are chiefly in the form of a

pentagon, so closely situated on their sides, though perfectly distinct from top to bottom, that scarcely any thing can be introduced between them. The columns are of an unequal height and breadth; some of the highest visible above the surface of the strand and at the foot of the precipice, are about twenty feet; none of the principal arrangements exceed this height; how deep they are under the surface has not yet been ascertained. This causeway extends nearly 200 yards, visible at low water, how far beyond is uncertain; from its declining appearance however, towards the sea, it is probable it does not extend under water to a distance any thing equal to what is seen above.* The breadth of the causeway, which runs out into one continued range of columns, is, in general, from twenty to thirty feet; at one place or two it may be nearly forty feet for a few yards. The highest part of this causeway is the narrowest, at the very foot of the impending cliff whence the whole projects, where, for four or five yards, it is from ten to fifteen feet.

The columns of this narrow part incline from a perpendicular a little to the westward, and form a slope on their tops, by the very unequal height of the columns on the two sides, by which an ascent is made at the foot of the cliff from the head of one column to the next above, to the top of the causeway, which, at the distance of half a dozen of yards from this, assumes a perpendicular position, and lowering in its general height, widens to from twenty to thirty feet, and for one hundred yards nearly, is always above water. The tops of the columns for this length being nearly of an equal height, they form a grand and singular parade that may be easily

* Mr. Pennant is of opinion that this causeway runs under the bed of the ocean, re-appearing at Staffa (one of the Hebrides in Scotland), the rock Humble, sixty miles north of Staffa, and at the isle of Skye, all nearly on the same meridian.

walked on, rather inclining to the water's edge. But from high water mark, by the continued surges on every return of the tide, the platform lowers considerably, and becomes more and more uneven, so as not to be walked on but with the greatest care. At the distance of 150 yards from the cliff, it turns a little to the east for twenty or thirty yards, and then sinks into the sea.

The figure of these columns is mostly pentagonal, or five-sided; some few are of three, four, and six sides; what is very extraordinary and particularly curious, is, that there are not two columns among ten thousand to be found, that either have their sides equal amongst themselves, or whose figures are alike. Nor is the composition of these columns or pillars less deserving the attention of the curious spectator. They are not of one solid stone in an upright position, but composed of several short lengths, curiously joined, not with flat surfaces, but articulated into each other like a ball and socket, the one end at the joint having a cavity, into which the convex end of the opposite is exactly fitted. The depth of the concavity is generally about three or four inches. And what is still further remarkable of the joint, the convexity, and the correspondent concavity, are not conformed to the external angular figure of the column, but exactly round, and as large as the diameter of the column will admit, and consequently, as the angles of these columns are in general extremely unequal, the circular edges of the joint seldom coincide with more than two or three sides of the pentagonal, and from the edge of the circular part of the joint to the exterior sides and angles, they are quite plain. It is likewise very remarkable that the articulations of these joints are frequently inverted; in some the concavity is upwards, in others the reverse. The length also, of these particular stones, from joint to joint, is various; in general, they are from eighteen to twenty-four inches long, and for the most part

longer towards the bottom of the column than nearer the top, and the articulation of the joints sometimes deeper. The size of the columns is as different as their length and figure; in general they are from fifteen to twenty inches in diameter. There is no trace or uniformity of design throughout the whole combination except in the form of the joint and the general pentagonal shape. What is extraordinary and curious is, that notwithstanding the universal dissimilitude of the columns, both as to their figure and diameter, and though perfectly distinct from top to bottom, yet is the whole so closely joined at all points, that there is scarcely room to introduce a knife between them either on the sides or angles.

The whole exhibition of this great plan of nature, so far superior to the little things done by man, is a confused regularity and disuniformity, displaying too much diversity of plan to be all seen or comprehended at once. A considerable way along the coast, the cliffs, rising in some parts from two to three hundred fathoms above the level of the sea, present similar appearances. At the point which bounds the bay on the east, and just above the narrowest part of the great causeway, a long collection of pillars called the Needles are seen, the tops of which, just appearing out of the sloping bank, plainly shew them to be in an oblique position, and about half way between the perpendicular and horizontal. These seem to have been removed from a perpendicular to their present oblique position, by the sinking or falling of the cliff.

CURIOUS ROASTING SPIT.

THE most singular spit in the world is that of the Count de Castel Maria; one of the most opulent lords of Treviso. This spit turns 130 different roasts at once, and plays 24 tunes, and whenever it plays, cor-

responds to a certain degree of cooking, which is perfectly understood by the cook. Thus a leg of mutton *a l' Anglaise*, will be excellent at the 12th air; a fowl *a la Flamande*, will be juicy at the 18th, and so on. It would be difficult, perhaps, to carry further the love of music and gourmandizing.

THE ALPHABET.

THE 24 letters of the alphabet may be transposed 620,448,401,733,239,439,360,000 times. All the inhabitants of the globe, on a rough calculation, could not, in a thousand million of years, write out all the transpositions of the twenty-four letters, even supposing that each wrote 40 pages daily, each of which pages contained 40 different transpositions of the letters.

COLD AND ICE.

COLD* is a quality equally as indefinable as fire, and is best known from its effects. It can, however, be reflected in the same manner as caloric; and if a piece of ice be placed in a warm room before a concave mirror, and a thermometer placed in its focus on the opposite side, it will fall to the freezing point, notwithstanding the high temperature of the air in the room. Whatever are the properties of fire, those of cold seem to be directly opposite. Fire increases bodies in size, and cold contracts them; fire tends to

* The sensation of cold and heat arises from the tendency which caloric has to diffuse itself equally through all substances in its vicinity. If the hand be put upon a cold body, part of the caloric contained in the hand leaves it to unite with the cold body; this produces the sensation of cold. On the contrary, if the hand be placed on a hot body, part of the caloric or matter of heat leaves the hot body and enters the hand: this produces the sensation of heat.

dissipate their substance, cold condenses them, and strengthens their mutual cohesion. Fluids contract sensibly with cold till they begin to freeze, when they dilate and take up more room; and hence liquor frozen in a full vessel bursts it: musquet barrels, cannon, bombs, rocks, &c. have been burst by frost. When water is frozen, it likewise is lighter than when in a fluid state. The proportion that water occupies in point of space when turned into ice, and in a fluid state, is as eight to nine. That ice is lighter than water, is known from its swimming on its surface. Ice, in northern regions, is harder than in lower latitudes. The ice of Spitzbergen and the Greenland seas is so hard, that it is very difficult to break it with a hammer. During the hard frost in 1740, a palace of ice was built at St. Petersburg after the most elegant model, and the justest proportions of Augustan architecture. It was fifty-two feet long, and twenty feet high: the materials were quarried from the surface of the Neva, and the whole stood glistening against the sun with a brilliancy almost equal to his own. To increase the amusement, six cannons of ice, two bombs, and mortars, all of the same materials, were planted before this extraordinary edifice. The cannon were three-pounders, they were charged with gunpowder and fired off; the ball of one of them pierced an oak plank at sixty paces distance, and two inches thick, nor did the piece burst with the explosion. Ice melts sooner on some substances than on others, without any known cause; it melts sooner in a silver plate than on the palm of the hand, and also on copper than on any other metal. It dissolves sooner in water than exposed to air of a similar temperature; sooner in water a little warm than near the fire where it is hotter. It melts sooner in a vacuum than exposed to the atmosphere; if it takes twenty minutes to dissolve in the latter, it will be but four minutes in the former. Water congeals in a glass

which is set in salted snow; and, if only the under part of the glass stands in the snow, the congelation happens from below upwards. In this case, the glass does not readily spring or crack; but if you cover it entirely with salted snow, in order to promote a congelation all over, and thus prevent the discharge of the air, the glass breaks. By the assistance of snow various liquids are cooled and frozen, but when that article is wanting, the experiments do not succeed. Boerhaave gives us a method of making ice without the aid of snow or ice. To a quart of the coldest water that can be had, add three ounces of salt; prepare another quart in the same manner, the salt will make each of them colder than before, mix them together, and this will make them colder still. Two quarts of water prepared and mixed in the manner of the two first, are to be mixed with these, which will still increase the cold in a much higher degree. The whole of this operation is to be carried on in a cold cellar, and a glass of common water is then to be placed in the vessel of liquor thus artificially cooled, which will be turned into ice in the space of twelve hours. Of all salts sal ammoniac best answers this purpose.

ICE IN INDIA.

The method adopted by the Indians to obtain ice, about the latitude of the Tropic of Cancer, or further down, is very ingenious. In India it never freezes naturally. They dig pits in the ground above two feet deep, which they line with dried sugar-canes or Indian corn. On this they place very shallow dishes made of unglazed and very porous earthenware, and filled with soft water that has been boiled. The dishes are deposited in the evening, and in consequence of the evaporation from the outside of the dishes, a considerable portion of the water is found frozen next morning. The ice is collected before sun rise, and rammed into a cellar underground,

lined with straw, where in consequence of its own accumulated cold, it freezes into a solid mass of ice!

HAIL.

HAIL is merely frozen rain; and the only difficulty in its natural history is, to account for its congelation. All the great falls of hail have been attended by thunder and lightning; and on all occasions, when there is hail, there is a great conflict among the clouds, so that we consider hail, in some degree, as the produce of the same aërial or electric process as that of waterspouts. In this manner, the vapours are kept suspended by the intensity of the electric charge and the whirling motion, with a much greater degree of density than they ever have in clouds; and are also, by the conflict caused by the combining electricities, carried into more elevated regions than the cumulo clouds ever ascend to, and thus enter the regions of perpetual congelation, so that they are there solidified into those icy masses, of which natural historians give many surprising accounts.

In Italy, 1210, there fell a shower of hailstones of enormous size, some of them weighing an hundred pounds. It was attended with a strong smell of sulphur, and the stones were of a bluish colour. Another fell at Lisle, 1786, of a large size, some of them in the middle contained a brown substance, which exploded in the fire. April 29th, 1697, a large black cloud from Caernarvonshire, passed over Cheshire and Lancashire, which threw down hailstones of half a pound weight. Its tract was sixty miles in length, and two in width. May 4th, in the same year, a shower fell in Hertfordshire, wherein were stones of fourteen inches in circumference. They killed several persons. But there are records of masses of ice that have been precipitated from the atmosphere, or thrown down by waterspouts.—*Taylor's "Key to the Knowledge of Nature."*

SNOW.

AMONG the various phenomena, not one is more worthy of discussion than that of snow, which is confessedly one of the most curious productions of nature, and, in the remotest ages of antiquity, has excited the admiration of the poets and philosophers, whether sacred or profane. The author of the book of Job, in the discourse which he puts into the mouth of Elihu, concerning the glorious and incomprehensible works of the Deity, thus expresses himself: "God thundereth marvellously with his voice: great things doeth he, which we cannot comprehend; for he saith to the snow, Be thou on the earth." And he represents the Omnipotent Jehovah, in his sublime expostulation with the patriarch, thus demanding: "Hast thou entered into the treasures of the snow, or hast thou seen the treasures of the hail, which I have reserved against the time of trouble, against the day of battle and war?" "He giveth (says the Psalmist) snow like wool: he scattereth the hoar-frost like ashes. He casteth forth his ice like morsels: who can stand against his cold?" "At his commandment (says the wise son of Sirach) he maketh the snow to fall apace. As birds flying he scattereth the snow, and the falling down thereof is as the lighting of grasshoppers. The eye marvelleth at the beauty of the whiteness thereof, and the heart is astonished at the raining of it."

With respect to the philosophical account of this well-known meteor, naturalists are agreed, that it is formed by the freezing of the vapours in the atmosphere. The snow we receive may, properly enough, be ascribed to the coldness of the atmosphere through which it falls. When the atmosphere is warm enough to dissolve the snow before it arrives to us, we call it rain; if it preserve itself undissolved, it makes what we call snow. It differs from the particles of hoar-frost, in being crystallized, as it were, which they are

not. This appears on the examination of a flake of snow by a magnifying glass; when the whole of it will seem composed of five shining spicula, or points, diverging like rays from a centre. As the flakes fall down through the atmosphere, they are continually joined by more of these radiated spicula, and thus increase in bulk like the drops of rain or hail-stones. Dr. Grew, in a discourse on the nature of snow, observes, that many parts of it are of a regular figure, for the most part so many little rowels or stars of six points, and are as perfect and transparent ice as any we see on a pond. Upon each of these points are other collateral points, set at the same angels as the main points themselves: among which there are divers others irregular, which are chiefly broken points, and fragments of the regular ones. Others also by various winds seem to have been thawed, and frozen again into irregular clusters; so that it seems as if the whole body of snow was an infinite mass of icicles irregularly figured. That is, a cloud of vapours being gathered into drops, those drops forthwith descend, and, in their descent, meeting with a freezing air as they pass through a colder region, each drop is immediately frozen into an icicle, shooting itself forth into several points; but these, still continuing their descent, and meeting with some intermitting gales of warmer air, or, in their continual waftage to and fro, touching upon each other, are a little thawed, blunted, and frozen into clusters, or entangled so as to fall down in what we call flakes.

Dr. E. D. Clarke, in his *Travels*, (vol. i. p. 11,) records a very curious and beautiful phenomenon, which he witnessed before the breaking up of the winter season at St. Petersburgh: Snow, in the most regular and beautiful crystals, fell gently on our clothes, and on the sledge, as we were driving in the streets: all of them possessed exactly the same figure, and the same dimension. Every particle consisted of a wheel or star, with six equal rays bounded by circumferences

of equal diameters: they had all of them the same number of rays branching from a common centre. The size of each of these little stars was equal to the circle presented by dividing a pea into two equal parts. This appearance continued during three hours, in which time no other snow fell, and there was sufficient leisure to examine them with the strictest attention. As water, in its crystallization (continues Dr. Clarke), seems to consist of radii diverging from a common centre, by the usual appearances on the surfaces of the ice, it might be possible to obtain the theory and ascertain the laws from which this stellar structure results. Monge, president of the French Institute, noticed, in falling snow, stars with six equal rays, which fell during winter, when the atmosphere was calm. This is also recorded by Haüy.

The lightness of snow, although it is firm ice, is owing to the excess of its surface, in comparison to the matter contained under it; and thus gold, the most ponderous of all bodies, when beaten into leaves, will ride upon the least breath of air. The whiteness of snow is owing to the small particles into which it is divided; for ice when pounded will become equally white. An artificial snow has been made by the following experiment: A tall phial of aquafortis being placed by the fire till it is warm, and filings of pure silver, a few at a time, being put into it, after a brisk ebullition, the silver will dissolve slowly. The phial then being placed in a cold window, as it cools, the silver particles will shoot into crystals, several of which running together will form a flake resembling snow, and descend to the bottom of the phial. While these are descending, they represent perfectly a shower of silver snow, and the flakes will lie upon one another at the bottom, like real snow upon the ground. In a word, a shower of snow, although so common with us, and therefore so little regarded, is, in itself, a most beautiful spectacle, and is considered by the natives of southern climes, on their arrival

here, as the most extraordinary and amazing phenomena of nature.—*Contemplative Philosopher.*

MANUFACTURE OF PINS.

Dr. Birkbeck, in a recent lecture at the Mechanics' Institution, speaking of the manufacture of pins, stated that no less than eighteen individuals are employed in the manufacture of this little implement; some have extended this number to twenty-five, but they must have included processes which occur previous to the drawing of the brass wire. The manufacture of wire, by drawing it through a steel plate fixed perpendicularly on a table, is supposed to have originated at Nuremberg or Augsberg, in the fourteenth century; but the present mode of drawing through a steel plate, by the addition of revolving cylinders, urged by horses, water, or steam, is of comparatively recent invention. This draw-plate is pierced with a number of conical holes of different sizes, the size of the smaller orifice determining the diameter of the wire, which is seized by a strong pair of nippers, and forcibly drawn through these holes when the plate is placed on the draw-frame. As the pin-maker requires a very small shaft for his pins, the wire is made to pass through the smallest holes in the draw-plate; it then requires to be made straight, and the business of the pin-maker commences by cutting it into lengths sufficient to make six pins. One of these steel draw-plates was exhibited to the audience, after which it was placed on a draw-frame, and a piece of thick wire was dragged through several of its orifices in succession, and was elongated in proportion to the diameters of the holes through which it had passed.

The boy who points the pins takes about a dozen of the lengths of wire in his hand at once, and the spectator is astonished by the dexterity with which

he contrives to keep them all revolving on their longitudinal axes, while he applies their extremities, first to a coarse grinding-stone, and then to a finer one, revolving near the other on the same axis, to give them the necessary polish. The revolution of the wires is necessary to prevent the ends from being ground flat, and so rapidly is the operation performed, that a boy will point 16,000 pins in an hour. As soon as the two ends of the wire are pointed, a pin is cut from each extremity, and the pointing is repeated till six pins are cut from each wire.

The process of making the heads of pins, or, as it is termed, head-spinning, consists in causing a finer wire to revolve with great rapidity round a straight piece of wire of proper diameter, which is afterwards drawn out, leaving the spiral coil in the form of a hollow tube, which is then cut into pieces, every two rounds of the wire making one pin's head. The heads are then put into an iron pan, and made red hot, to soften them, after which they are ready for use; and the next important point is to fix them properly on the shafts. In the year 1543, it was enacted by statute 34 and 35 of Henry VIII., cap. 6, 'That no person shall put to sale any pins but only such as shall be double-headed, and have the heads *soldered* fast to the shanks of the pins, well smoothed, the shanks well shapen, the points well and round filed, cauted and sharpened.' But, in our times, no man could get a living at pin-making, if he had to *solder* the heads on, or fix them by riveting. All that is now required is, for a boy to thrust the shaft of a pin amongst the heads, and, catching one of them on its extremity, he fixes it firmly by striking it with a hammer on an anvil with a small hole in it. This is done with surprising rapidity, and the principal cause of the firm adhesion which takes place between the head and the shaft, appears to be the attraction of cohesion allowed to operate by the closeness of contact.

When the pins are thus completely formed, they are whitened by placing them in a vessel containing a solution of grain tin in tartaric acid, or the lees of wine. In this process we have the advantage of brilliancy of surface over the continental pin-makers, who use lead and mercury instead of tin; and it is said, likewise, that, on this account, a puncture from a British pin is of much less consequence than when made with a foreign one. The pins, when thus whitened, have still a dull appearance, which is removed by agitating them in a tub containing bran; and, the pins being thus polished by friction, the bran is detached by winnowing, exactly as chaff is separated from grain. The pins are then ready for the final process of papering, an operation not easily understood, as to the mode of folding the paper, and the rapid introduction of the pins, without seeing it actually performed.

Dr. Birkbeck unfolded a paper containing four hundred and three common pins, and stated that, after paying all the expenses of wire, labour, &c. incurred in the process just described, the whole sum charged by the wholesale dealer from whom they were obtained, for this quantity of pins, amounted to no more than *twopence farthing*. They are, therefore, sold in the first instance at the rate of forty-four and a fraction for one farthing, producing consequently somewhat less to the manufacturer. The lecturer afterwards produced another paper of pins, containing four hundred and eighty, which were sold for *ninepence halfpenny*, or at the rate of about twelve and a half for a farthing. In this sample, as well as in several other specimens of patent pins exhibited to the audience, the perfection of the heads enabled the manufacturer to obtain a better price; for the great difficulty in pin-making is to fix the head firmly, and, in regard to what may be called the machine-made pins, without leaving it in a ragged state.

As an article somewhat resembling in its origin a

pin's head, and perhaps suggested in the first instance by bits of the spiral coil before described, the lecturer mentioned a simple ornament, the *spangle*. The plan of making this little embellishment of dress was long confined to the individual by whom it was invented; who made a considerable fortune by the contrivance. It would naturally be imagined that the spangles are cut out of a thin plate of metal, by means of a hollow punch, and the holes in the centre of each made by a solid punch; but, in reality, they are formed of a circular portion, or single ring of wire, which, being laid upon an anvil, and struck with considerable force, is extended in all directions equally, and converted into a flat ring with a small hole in the centre, or into a spangle; at the same time that an almost perfect junction of the two extremities of the ring of wire is effected by the cohesive attraction there brought into action, as was described to occur in fixing the head of a pin.

The consumption of pins is estimated at *sixteen millions* a day. There is a large manufactory on the Surrey side of Blackfriars Bridge, where they are made by machinery. This manufactory, if kept fully employed, could supply the whole of the above immense demand.

THE ZEBRA.

THE Zebras of the Cape are very beautiful creatures, and are improperly called wild asses, for they are of the size of an ordinary saddle-horse, and resemble an ass in nothing but the length of their ears. The legs of this fine and well-proportioned animal are slender, and the hair on his body soft and sleek. On the ridge of his back a black streak extends from his mane to his tail, and on each side are a great many streaks of various colours, that meet under his belly in so many circles; some are white, some yellow, and some of a

chestnut-colour; and these colours loose themselves in one another, in a very beautiful manner. His head, ears, mane, and tail, are also streaked with the same variety. He is so swift, that it is said, there is not a horse in the world that can keep up with him.

Attempts have been made to domesticate the zebra, and to reduce it to obedience like the horse, but as yet the success has not been very considerable. Experiments of this kind have been chiefly made in Holland; and we are told by the Count de Buffon, that zebras have been yoked to the stadtholder's chariot; this, however, proved to be a piece of misinformation, and is accordingly contradicted in the sixth supplemental volume.

CURIOUS PLANTS.

NYMPHÆ NELUMBO *or* SACRED EGYPTIAN BEAN.

In hot climates, where water is the best boon of Heaven, flourish the several kinds of Nymphæas. These present the purest colours, and are of an azure blue, blushing red, or pale yellow, the three primary colours, and also of a dazzling white, all which majestically (different from our humble aquatics,) rise with their foliage above the surface of the flood, and present their luxuriant leaves to the vaulted heavens. Nature, as if designing these plants to be the master-piece of her creative power, besides superior grace and beauty, has also added utility; for the seed vessels contain nourishing food for man, and the roots produce a profitable potato. As the Egyptians worshipped whatever was useful, they accounted those plants sacred; in their feasts they crowned themselves with the flowers, and their altars were decorated with the same. The Egyptian Ceres has the seed vessel of the blue lotus in her hand, which the Romans corrupted

into the poppy, and sometimes also that of the nelumbo, which the Greeks mistook for the horn of Amalthea.—Dr. Thornton.

PROTEA CYNAROIDES, *or* ARTICHOKE SILVER-TREE.

This shrub is one of the most beautiful plants which are to be found at the Cape of Good Hope, a country so extremely rich in vegetable productions. It has the general appellation Protea, in allusion to Proteus, son of the Ocean and Thetis, as he could assume all forms; and this tribe is not less distinguished by the variety of shapes, in which it appears, than for possessing a leaf, which in some species, has a glossy hue like silver, varying in different lights, which it the more readily effects by the waving of its foliage. It may have the name of Proteus also from the variety in the flowers of sixty different species of this genus. In this species the stem is perfectly erect, and without branches, and at different distances all around proceed channelled peduncles, which seem to form a part of each leaf, which is spreading, ovate, and possesses a wave, that gives a singularity and beauty to the whole plant. The flower, as the specific name expresses, has the appearance of an artichoke, but it is a perfect cone with the apex downwards, and its imbricated scales below are of a greenish cast, whereas the leaves above are of a most delicate texture, having the rich colouring of petals, being of a fine red, and in several rows. Within this cone, or common calyx, are situated the numerous florets, which are small and slender; the corolla is of a purple colour, and cut into four thin segments, and contains the filaments supporting four anthers, which projecting from the florets, and placed in a circular order, and being incumbent towards the centre, give a very extraordinary appearance to the whole flower.—Dr. Thornton.

STAPELIA, *or* POISON-PLANT.

Dispersed over the arid wilds of Africa, in pyramidical forms, issue the fleshy stems, destitute of leaves, of the several Stapelias. These stems are on every side armed with hooks like claws. The juices of this plant are so acrid, that the smart they occasion on the tongue will be sensible a long time, and even fatal, if tasted beyond a certain proportion. Nature has well marked it of the natural order, the lurid, or poisonous, for the corolla, which is deeply cleft into five segments, is of a dusky purple, and dingy yellow, and speckled like the belly of a serpent, besides being fringed with hairs, which give to this flower something of an animal appearance. It has likewise so strong a scent, resembling carrion, that blow-flies in abundance hover round it, and mistaking the corolla for flesh, deposit there their eggs, which are soon converted into real maggots, adding to the horror of the scene, some being seen writhing among the purple hairs of the flowers, and others already dead for want of food—the vegetable in this rare instance, deceiving and overcoming the animal creation.—DR. THORNTON.

MIMOSA GRANDIFLORA, *or* LARGE-FLOWERING SENSITIVE PLANT.

This most elegant shrub is a native of the East Indies. It was first introduced into our gardens in 1769, by Mr. Norman. It is found frequent in mountainous districts. It sleeps at regular periods, by closing its two corresponding leaflets together; and the flowers are so rapid in their growth, as to give them also the appearance of spontaneous motion, nature having well dissembled in this tribe of vegetables the high attributes of sensation and of action. Growing to the size of a moderate tree, it is not armed with spines, as many of its congeners; nor does it possess, like the Mimosa Pudica (the common Sensitive Plant), the power of retracting its branches, so as to set the

whole plant into general motion upon the rude approach of an invader. Secreting honey, it gives a delightful food to the humming bird.

VALISNERIA SPIRALIS, *or* WATER PLANT.

This extraordinary plant is found in the East Indies, in Norway, and various parts of Italy. They have their roots at the bottom of the Rhone; the flowers of the female plant float on the surface of the water, and are furnished with an elastic spiral stalk, which extends or contracts as the water rises and falls; this rise or fall, from the rapid descent of the river, and the mountain torrents which flow into it, often amounts to many feet in a few hours. The flowers of the male plant are produced under water, and as soon as their farina, or dust, is mature, they detach themselves from the plant, and rise to the surface, continue to flourish, and are wafted by the air, or borne by the current, to the female flowers. In this, resembling those tribes of insects where the males at certain seasons acquire wings, but not the females, as ants and several other insects. These male flowers are in such numbers, though very minute, as frequently to cover the surface of the river to a considerable extent.—DARWIN'S *Botanic Garden.*

THE RAPIDITY OF PLANETARY MOTION.

THE heavenly bodies, vast in magnitude, infinite in number, and the tenants of space, are in rapid motion; but what can imagination possibly conceive of that Power, which impels the movement. An idea may be acquired of this rapid motion by a reference to familiar objects,—the velocity of a ship impelled by the wind, particularly if urged over the rolling billows by a furious tempest; the swiftness of a bird winging its flight through the air, especially if pursued by an eagle: the motion of a ball projected from

a cannon which, in some cases, is at the rate of 800 miles in an hour. But these are creeping things,—Saturn, one of the most tardy in its course of any of the planets,—a globe 900 times larger than the earth, is impelled at the rate of 22,000 miles in an hour, carrying with him a system of stupendous rings, and seven moons larger than the earth's satellite. Jupiter, whose vast circumference would comprise within it a thousand such globes as the one we inhabit, moves at the rate of 29,000 miles an hour. This earth is urged forward at the rate of 68,000 miles in an hour, and Mercury still faster, being 107,000 miles in the same time; but even these motions are slow, when compared with that of the comet of 1680, which went half round the sun in ten hours and a half, and its tail (at least an hundred millions of miles in length) turning round in the same time, keeping nearly in the same direction opposite to the sun; the velocity of this comet, at this part of its orbit, (its perihelion) was 880,000 miles in an hour, and so closely did it approach the sun, that, supposing the centrifugal or projectile force to have been annihilated at the point of its course, it would have fallen into the sun in less than three minutes! In the sphere of the fixed stars, there is reason to believe that bodies are in motion, whose velocities are proportionably greater than any in the planetary system. One of the double stars completes its revolution in fifty-seven years; in estimating the orbit described by a lesser sun about a greater, it will not be necessary to suppose (though probably it is the case) that the two bodies are as remote from each other as the nearest fixed star is from our sun—namely, twenty billions of miles; were it even admitted that the line of separation between them was only a twentieth part of this distance, the revolving star would then move at the rate of 12,000,000 miles an hour.

RUINS OF PALMYRA.

ALL Syria, and perhaps the whole world, does not afford a view of more magnificent ruins than those of Palmyra, which evidently demonstrate its ancient opulence and grandeur.

This city was founded by King Solomon, in the desert of Syria, but it may be supposed, that so advanced a garrison as this, being above 300 miles from Jerusalem did not continue long in possession of the Jews, who, after Solomon's death, fell into civil dissensions. It undoubtedly submitted to the Babylonian and Persian monarchies, and afterwards to the Macedonians, under Alexander and the Seleucidæ; but when the Romans got footing in those parts, and the Parthians seemed to put a stop to their further conquests in the east, then this city, by reason of its situation, being a frontier town, and in the middle of a vast sandy desert, where armies could not well subsist to reduce it by force, was courted and caressed by the contending princes, and permitted to continue a free state, a mart or staple of trade for the convenience of both empires, as plainly appears from Appian and Pliny. With these advantages of freedom, neutrality and trade, for near two centuries, Palmyra grew wealthy and magnificent, and it was afterwards much adorned and enriched by the Emperor Adrian, to whom it submitted about the year of Christ 130. From the time of Adrian, to that of Aurelian, for about 140 years, this city continued to increase in power and riches, till Zenobia, the wife of Odenatus, and queen of Palmyra, as she is commonly called, having some dispute with Aurelian, after her husband's death, about a share in the empire, he marched against her, and having in two battles routed her forces, he shut her up and besieged her in Palmyra. The city was soon obliged to surrender, and Zenobia flying with her son, was pursued and taken; with which Aurelian being satisfied, he spared the

city, and leaving a small garrison in it, marched to Rome with this captive lady; but the inhabitants being willing to shake off the Roman yoke, cut off the whole garrison, which Aurelian understanding, though he was got into Europe, returned speedily with his army, took the city again without much opposition, put the people to the sword with uncommon cruelty, and delivered it to be pillaged by his soldiers. This calamity befel Palmyra about the year of our Lord 272; and though Aurelian did not then burn or destroy the buildings, yet the damage it sustained was never retrieved, so as to make any considerable figure ever after. In what age, or from what hand it received its final overthrow, which reduced it to its present miserable condition, we cannot gather from history; but it was probably burnt and desolated in the obscure ages of the world, during the wars of the Saracens.

These ruins lie in the desert of Syria, about 150 miles south-east of Aleppo, and have been visited by several of our countrymen, who have carefully examined and described them. By the space they take up, the city appears to have been of vast extent; but there are no vestiges of any walls remaining, nor is it possible to judge of the ancient figure of the place. The present inhabitants are about thirty or forty poor families, who live in little huts made of earth, within the walls of a spacious court, which formerly enclosed a most magnificent heathen temple dedicated to the Sun. This court is a square of 220 yards each side, encompassed with a high and stately wall, adorned with pilasters both within and without, to the number of sixty-two on a side; and had not the Turks, out of a vain superstition, purposely beat down the beautiful cornices, perhaps the whole world could not boast of more exquisite carvings, as one may judge from some remaining fragments. The west side, on which is the entrance, is mostly broken down, and near the middle of the square, another higher wall is

raised out of the ruins, which appears to have been part of a castle, probably built by the Mamelukes, for the security of the place. Before the whole length of this new front, except a narrow passage left for an entry, there is cut a deep ditch, faced with stone to the foot of the wall, which must have made it difficult to be assailed. This wall entirely shrouds the magnificent entry that belonged to the first fabric, of the stateliness whereof we may form some idea from the two stones that support the sides of the great gate, each of which is 35 feet high, both standing, and beautifully covered with vines and clusters of grapes exceedingly bold and natural.

As soon as we enter within the court, we see the remains of two rows of very noble marble pillars, 37 feet high, with capitals of admirable workmanship. About fifty of these only remain entire; but there must have been many more, for they appear to have run quite round the whole court, and to have supported a very spacious double piazza, or cloister. The walk on the west side of this piazza, which is opposite to the front of the temple, seems to have exceeded the rest in breadth and beauty; and at each end are two niches for statues at their full length, with their pedestals, borders, supporters, and canopies, all carved with the greatest art and curiosity.

In the middle of this once beautiful enclosure, but now filled with the dirty huts of the inhabitants, stood the Temple of the Sun, encompassed with another row of pillars of a different order, and much taller than the former, being about fifty feet high; of which only sixteen are now remaining. The space included within these pillars was fifty-nine yards in length, and about twenty-eight in breadth; and the temple was thirty-three yards long, and fourteen or fifteen broad, pointing north and south, with a magnificent entry on the west, exactly in the middle of the structure. The outward walls of this temple are still standing, in which it is observable, that the win-

dows are narrower at the top than the bottom, and not very large, but all adorned with excellent sculptures. Just over the door any one may discern part of the wings of a large spread-eagle, extending its whole width, which made Mr. Halifax at first imagine it might have been rather a cherub overshadowing the entrance, there being nothing of the body remaining to guide one's judgment, but afterwards, seeing other eagles on stones that were fallen down, he concluded this must have been one likewise, only of a much larger size. Never were vines, bunches of grapes, and the other sculptures in general, executed in so bold and lively a manner; and every thing to be seen about the small remains of this temple, induces us to believe it was once a most glorious structure.

The Turks, or rather the Mamelukes, have built a roof to these walls, supported by small pillars and arches, but a great deal lower, and in other respects disproportionate to what the ancient covering must have been; and they have converted it into a mosque, adding to the south end new ornaments after their manner, with inscriptions and sentences out of the Koran, written in wreaths and flourishes; but at the north end of the building, which makes no part of the mosque, there are remains of much greater art and beauty, viz., the most curious fret-work and carvings. In the middle of the roof is a dome or cupola, about two yards in diameter, made of some artificial composition, which is, however, an admirable piece of workmanship.

After viewing this temple, our author went to another situation, where he had a prospect of such stately ruins, that if one may frame an idea of the original beauty of Palmyra, by what is still remaining, it may be questioned whether any city in the world could have vied with it in magnificence. Advancing towards the north, we have before us a fine obelisk, about 50 feet in height, consisting of seven large

stones, besides its capital and the wreathed work about it. Its circumference just above the pedestal is four yards six inches, and its sculptures, as in other places, are extremely beautiful; but it has no statue on the top of it, as probably it had formerly. About a quarter of a mile distant from this, two other large pillars are to be seen, the one towards the east, and the other towards the west; which would incline one to think there was a continued row of them.

Proceeding forwards, about 80 yards from the obelisk, we come to a large and lofty entry, which, for the beauty of the workmanship, is not inferior to any thing before described, and leads into a noble piazza or portico, above half a mile in length, and 40 yards in breadth, enclosed within two rows of stately marble pillars, 26 feet in height, and eight or nine in circumference. One hundred and twenty-nine of these are standing and entire, but upon a moderate computation, there could not have been less originally, than five hundred and sixty. This spacious piazza was terminated by a row of pillars, standing somewhat closer than those on the sides; and perhaps there might have been a sort of banqueting-house above, or else a stately building, whose ruins lie at a little distance to the left, might have been allotted to that use, being built of fine marble, and having an air of delicacy in the workmanship beyond what is discernible in the piazza. The pillars that supported it are of one entire stone: and one of them, that was fallen down without breaking, measured 23 feet in length, and 8 feet 9 inches in circumference.

On the west side of the great piazza are several gates leading into the court of the palace, two of which, when in their perfection, must have been exceedingly magnificent and beautiful, not only for the elegance of the work in general, but in particular for the noble porphyry pillars with which they were adorned, each gate having four in its front, two on

one hand, and two on the other. There is only one of these now standing in its place, though there is another entire; they are about 30 feet high, and 9 in compass, and so exceedingly hard that a piece cannot be broken off without great difficulty. The palace itself is so entirely ruined, that no judgment can be formed of what it was when standing, either as to its figure or workmanship; but it was certainly answerable to the splendour of the city.

On the east side of the long piazza stands a vast number of marble pillars, some perfect, and others deprived of their beautiful capitals, but so scattered and confused, that it is not possible to reduce them to any order, so as to conjecture for what purpose they originally served. In one place we find several of them arranged in a square, paved at the bottom with broad flat stones, but without any roof or covering; and at a little distance from thence are the remains of a small temple, which seems to have been of curious workmanship, but the roof is quite gone, and the walls are much defaced and consumed. Before the gate of it, there remains a piazza, supported by six pillars, two on each side of the door, and one at each end; and the pedestals of those in the front have been filled with inscriptions, which are now defaced and illegible.

The sepulchres of Palmyra are worth the attention of the curious; being square towers four or five stories high, standing on each side of a hollow way, towards the north part of the city. They extend in length, the space of a mile, and perhaps anciently they might extend a great way farther. They are all of the same form, but different in magnitude and splendour, according to the circumstances of their founders. Two of these sepulchres are more entire than the rest, though not without marks of the Turkish fury, as well as the injuries of time. They are rather larger than our common church steeples, and five stories high, the outside being of ordinary stone,

but the partitions and floors within of good marble, and adorned with lively sculptures and paintings, and the busts of men and women, most of them defaced and broken. Under these busts, or on the sides of them, are some inscriptions in an unknown character, being probably the names of the persons there deposited. One of these sepulchres has a door on the south side, from whence there is a walk across the middle of the building, and the floor being broken up, affords a view of the vaults below. The spaces on each hand are divided by thick walls into six partitions, each capable of receiving the largest corpse; and if piled one upon another, as their method seems to have been, each of those partitions might contain six or seven bodies. In the lowest, second, and third stories, these partitions are uniform, except that from the second floor one partition is reserved for a staircase. In the upper floors, the building being somewhat contracted towards the top, there is not room for a continuation of the same method; and therefore the two highest stories are not so divided, nor perhaps ever had any bodies laid in them, unless that of the founder, whose statue, in a recumbent posture, is placed in a niche, in the front of the monument, so as to be seen within and without, and near this statue is a Greek inscription. The other monument is similar, only the entrance and front are towards the north, and the paintings are not so fine; but the carvings are as good, and the whole looks as stately as the former. Besides, it has the advantage with respect to age, being not so old as the other by a hundred years, as appears from the date of an inscription over a niche in the front.

From these sumptuous mausolea, and other magnificent structures, our author thinks it reasonable to conclude, that the Palmyrenes were a potent and opulent people before they became subject to the Romans, and that they were not altogether indebted to them for their greatness.—SMITH'S *Wonders.*

REMARKABLE LAKES.

On the top of a ridge of mountains in Portugal, called Estrella, there are two lakes of great extent, and depth, especially one of them, which is said to be unfathomable. What is chiefly remarkable in them is, that they are calm when the sea is so, and rough when that is stormy; which makes it probable that they have a subterraneous communication with the ocean; and this seems to be confirmed by the pieces of ships they occasionally throw up, though almost forty miles distant from the sea. There is another extraordinary lake in this country, which, before a storm, is said to make a frightful rumbling noise, that may be heard at the distance of several miles. And we are also told of a pool or fountain, called Fervancas, about 24 miles from Coimbra, that absorbs not only wood, but even the lightest bodies thrown into it, such as cork, straws, feathers, &c., which sink to the bottom, and are seen no more. To these we may add a remarkable spring near Estremos, which petrifies wood, or rather incrusts it with a case of stone; but the most surprising circumstance is, that it throws up water enough in summer, to turn several mills, whereas in winter it is perfectly dry.—Smith's *Wonders*.

LAKE OF GENEVA.

The Lake of Geneva is always considerably higher in summer than in winter; commonly beginning to increase about the end of January, and continuing to rise till July or August. This circumstance is generally attributed to the melting of the snow and ice from the neighbouring mountains; but it seems highly probable, that there may be a concurrence of other causes. In calm weather, and even before sun-rise, the lake assumes a variety of colours, curiously intermixed, which is supposed to proceed from the reflec-

tions of the images on the shore blending together on the bright surface of the water.

Fish are found here in great abundance, and it is observable, that the different species seem to have cantoned themselves, and divided the lake among them; trouts being only found in the current of the Rhone, carp near Vevay, &c., but such fishes as only resort hither occasionally, spread themselves over all parts indifferently. The trout taken here are extremely large, and the pike have been sometimes known to weigh upwards of eighteen pounds.—SMITH'S *Wonders.*

LAKE OF WAHLESTATT.

THE Lake of Wahlestatt, in the canton of Glaris, in Switzerland, is completely environed with mountains, one of which has an aperture pierced through it near the top, called St. Martin's Hole. Through this hole the sky may be seen on a certain part of the lake, and it is the only inlet of the sun-beams upon a small village called Elm, for four weeks together, about the time of the equinox, every spring and autumn, when the solar rays are transmitted upon this village through St. Martin's Hole, as through a natural telescope.—SMITH'S *Wonders.*

LAKE OF THE DEAD SEA.

OF the lakes or seas in Asiatic Turkey, the most remarkable is the Lake Asphaltites, or Dead Sea, which lies in the south part of Judea, and into which the river Jordan discharges itself. This lake is generally supposed to have had its origin from the destruction of Sodom and Gomorrah, the ruins of which cities some travellers pretend to have seen under the water. The formation of it indeed may be tolerably well accounted for, by supposing that the thunder

and lightning, which were undoubtedly concerned in the overthrow of those cities, falling in great abundance upon some pits of bitumen, the veins of that combustible matter took fire, which penetrating into the bowels of the country, and the ground subsiding, an earthquake ensued; and so the waters running to this cavity, and mixing with a vast quantity of bituminous matter, would form a lake of such qualities as it is at present known to possess. This lake seems to have obtained the name of the Dead Sea, from a notion that its steam or stench killed all birds that attempted to fly over it, and that no fish or other creature could live in it. But as to the former, there is sufficient evidence of its being a mistake, birds being frequently seen flying across it without receiving any injury; and as to the latter, there is good reason to doubt the truth of it, some shells, like those of oysters, having been found upon the shore. The water, however, is extremely salt, bitter, and nauseous; which might probably have given rise to such a tradition.—SMITH'S *Wonders.*

THE LAKE OF KILLARNEY.

THE Lake of Killarney, in the province of Munster and county of Kerry, affords the most beautiful and picturesque prospects in nature. This lake is divided into three parts, called the upper, middle, and lower, lake. The northern, or lower lake, is six miles in length, and from three to four in breadth. On the side of one of the mountains, is O'Sullivan's cascade, which falls into the lake, making a noise which strikes the timid with awe. The view of this sheet of water is uncommonly fine, it appearing as if it were descending from an arch of wood, which overhangs it above seventy feet in height from the point of view. The islands are not so numerous in this as in the upper lake, but there is one of uncommon beauty called Innisfallen, nearly opposite O'Sullivan's cascade, which

contains eighteen Irish acres.* The promontory of Mucross, which divides the upper from the lower, is a perfect land of enchantment, and a road is carried through the centre of this promontory which unfolds all the interior beauties of the place. Among the distant mountains, *Turk* appears an object of magnificence, and *Mangerton's* more lofty and more interesting summit soars above the whole. The passage to the upper lake is round the extremity of Mucross, which confines it on one side, and the approaching mountains on the other. Here is a celebrated rock, called the Eagle's Nest, which produces wonderful echoes, the report of a cannon being answered by a succession of peals resembling the loudest thunder, which seems to traverse the surrounding scenery, and die away among the distant mountains. The upper lake is four miles in length, and from two to three in breadth. It is almost surrounded by mountains, from which descend a number of beautiful cascades. The islands in the lake are numerous and afford an amazing variety of picturesque scenes. The centre lake, which communicates with the upper, is small in comparison with the other two, and cannot boast of equal variety, but the shores are, in many places, indented with beautiful bays, surrounded by dark groves of trees. The east boundary is formed by the base of Mangerton, down the steep side of which descends a cascade, visible for 150 yards. This fall of water is supplied by a circular lake near the summit of the mountain, called the *Devil's Punch Bowl*; which, on account of its immense depth, and the continual overflow of water, is considered as one of the greatest curiosities of Killarney. One of the best prospects which this admired lake affords, is from a rising

* The Irish acre is in proportion to the English as eleven is to eighteen, that is, eleven acres Irish measure make about eighteen English. The Irish pole contains forty-nine square yards, and the English pole contains thirty and a quarter square yards.

ground near the ruined cathedral of Aghadoe. The depth of this lake is equally surprising, places under the rocky shores being from fifteen to twenty fathom deep, and some parts are from seventy to eighty fathom deep.

The island of Innisfallen, in the upper lake, already mentioned, is generally the dining place, where there is a kind of hall fitted up by Lord Kenmaer. What is very surprising here, is the spontaneous production of the *arbutus*, or strawberry tree, which is found in great plenty and perfection in many of these islands; it was probably introduced here by the monks who inhabited this place at a very early period. This plant was not much known about London so late as 1770. Near the lake of Killarney there is a rich copper mine wrought, which produces from fifty to sixty tons of ore per week.

THE HANGING TOWER OF PISA, IN TUSCANY.

THIS celebrated Tower, likewise called *Campanile*, on account of its having been erected for the purpose of containing bells, stands in a square close to the cathedral of Pisa. It is built entirely of white marble, and is a beautiful cylinder of eight stories, each adorned with a round of columns, rising one above another. It inclines so far on one side from the perpendicular, that in dropping a plummet from the top, which is 188 feet in height, it falls 16 feet from the base. Much pains have been taken by connoisseurs, to prove that this was done purposely by the architect; but it is evident that the inclination has proceeded from another cause, namely, from an accidental subsidence of the foundation on that side. The pillars are there considerably sunk; and this is also the case with the very threshold of ambition, meant to shew how far he could with safety deviate from

the perpendicular, and thus display a novel specimen of his art, he would have shortened the pilasters on that side, so as to exhibit them entire, without the appearance of sinking.

MAISON CARREE, AT NISMES.

If the Amphitheatre at Nismes strikes the spectator with an idea of greatness and sublimity, the Maison Carrèe enchants him with the most exquisite beauties of architecture and sculpture. This fine structure, as is evidenced by the inscription discovered on its front, was built by the inhabitants of Nismes, in honour of Caius Cesar, and Lucius Cesar, grandchildren of Augustus, by his daughter Julia, the wife of Agrippa. It stands upon a pediment 6 feet high, is 82 feet long, 35 broad, and 37 in height, without reckoning the pediment. The body of it is adorned with 20 columns engaged in the wall; and the peristyle, which is open, with 10 detached pillars that support the entablature. They are all of the Corinthian order, fluted and embellished with capitals of the most exquisite sculpture: the frieze and cornice are much admired, and the foliage is esteemed inimitable. The proportions of the building are so happily blended, as to give it an air of majesty and grandeur, which the most indifferent spectator cannot behold without emotion. To enjoy these beauties, it is not necessary to be a connoisseur in architecture: they are indeed so exquisite that they may be visited daily with a fresh appetite for years together. What renders them still more interesting is, that they are entire, and very little affected, either by the ravages of time, or the havoc of war. Cardinal Alberoni declared this elegant structure to be a jewel which deserved a cover of gold to preserve it from extreme injuries. An Italian painter, perceiving a small part of the roof repaired by modern French masonry, tore his

hair, and exclaimed in a rage, "Zounds! what do I see? Harlequin's hat on the head of Augustus?"

In its general architectural effect, as well as in all its details of sculpture and ornament, the Maison Carrèe of Nismes is ravishingly beautiful, and cannot be paralleled by any structure of ancient or modern times. That which most excites the astonishment of the admiring spectator, is to see it standing entire, like the effect of enchantment, after such a succession of ages, subjected, as several of them were, to the ravages of the barbarians who overrun the most interesting parts of Europe!

THE CHEMICAL WEATHER-GLASS.

A BOTTLE or vessel of glass, about ten inches long, and three quarters of an inch in diameter, filled with a peculiar mixture, has been recently sold to answer the purpose of the barometer, by the changes which it exhibits according to the state of the weather. The following is stated by Wiegleb to be the mode of composing this fluid.

Two drachms of camphor, half a drachm of purified nitre, and half a drachm of muriate of ammonia, are to be pulverized and dissolved in two ounces of proof spirits. This composition is to be put into a glass vessel as above described, the mouth of which is to be covered with paper, or a piece of bladder, perforated with a needle.

The changes which appear in this composition are stated to be of the following nature:

If the weather promise to be fine, the solid matter of the composition will settle at the bottom of the tube, while the liquid is pellucid; but previous to a change for rain, the compound will gradually rise, the fluid will continue transparent, and small stars will be observed moving or floating about within the vessel.

Twenty-four hours before a storm, or very high wind, the substance will be partly on the surface of the liquid, apparently in the form of a leaf, the fluid in such case will be very turbid, and in a state resembling fermentation.

During the winter, small stars being in motion, the composition is remarkably white, and somewhat higher than usual, particularly where white frosts or snow prevail. On the contrary, in summer, if the weather be hot and serene, the substance subsides closely to the bottom of the glass tube.

Lastly, it may be ascertained from what point of the compass the wind blows, by observing that the solid particles adhere more closely to the bottom, on the side opposite to that where the tempest arises—*Panorama of Science and Art.*

KALEIDOSCOPE.

Some time since, Dr. Brewster of Edinburgh, obtained a patent for a new optical instrument, which he calls *Kaleidoscope*, from the Greek words, *a beautiful form to see.* It consists of two mirrors, inclined to each other in an angle of about 30°. The object looked at is coloured glass, contained between two parallel object-glasses, and the whole is fitted up like a small telescope, about eight inches long. Nothing can exceed the beauty of the objects it produces, and their changes are truly magical. The instrument is intended to assist jewellers, glass-painters, and other ornamental artists, in the formation of patterns, of which it produces an infinite number.

THE END.

WILLIAM MILNER, PRINTER, CHEAPSIDE, HALIFAX.